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Frozen-Pack Fruit Markets

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FROZEN-PACK FRUIT MARKETS

By

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FROZEN-PACK FRUIT MARKETS

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HARRY CARLTON

INTRODUCTION

The market survey of the frozen-pack industry was undertaken primarily for the purpose of locating additional markets for Tennessee strawberries. Other frozen fruits and certain vegetables were included, because of their interest to Tennessee either as competitors of strawberries or as desirable products for Tennessee growers and processors.

The survey covered the large population centers of the United States—roughly, that section east of the Mississippi and north of Tennessee and North Carolina, where practically all frozen-pack products are processed and consumed.

The field work was carried on between June 15 and December 15, 1935, and the reports and estimates are based on a combination of the packs of 1934 and 1935.

Consumers, processors, cold-storage operators, brokers, jobbers, wholesalers, and retailers in the large consuming centers, were interviewed, and trade publications, and associations and individuals familiar with the food industry were consulted for general information. Agricultural experiment stations and state and Federal departments were visited for experimental, processing, and statistical information.

With the exception of northwestern production statistics, published by *Western Canner and Packer*, little in the nature of compiled data or other reliable published information was available.

Even the nomenclature is unsettled and somewhat confusing. The U. S. Department of Agriculture, in "Definitions and Standards for Food Products," issued in August, 1933 (S. R. A., F. D. No. 2., Rev. 4), gives the following definition: "Cold-pack fruit is the product obtained by packing, in a suitable container, properly prepared fresh fruit, with or without the addition of sugar and/or dextrose, and maintaining it at a temperature sufficiently low to insure its preservation." The term "cold-pack" is also used to describe a method of canning fruits and vegetables, and is confusing outside the trade.

In the trade the term "cold-pack" is applied to fruit packed and frozen in liquid-tight containers suitable for a mixture of fruit and sugar, although sugar is not always included in the pack. Berries frozen in standard fresh-fruit shipping crates are called "crate-frozen." The imported blueberries frozen without sugar in wooden lugs are called "frozen" blueberries. A new method of freezing berries without sugar and then packing them, usually in paper-lined fiber containers, is referred to as "single-frozen." These three types of pack are also referred to as "bulk-pack." However, red raspberries, blackberries, and other fruits packed without sugar in liquid-tight containers, are called "cold-pack."

Fruits, vegetables, fish, and meats, such as "Birdseye" products, packed in comparatively small packages for home consumption and for the institutional trade, are simply called frozen products.

Attempts have been made to standardize on the name "frozen-pack" for all these different packs, but the name has not been generally adopted.

In this report, "frozen-pack" is used as a comprehensive term covering all types of frozen-food packs, and the terms customary in the trade, as outlined above, are used to differentiate the various types of pack.

The trade describes the fruit-sugar mixture in terms of the number of pounds of fruit to which one pound of sugar is added. For example, 2 pounds of fruit to 1 pound of sugar is called "2 plus 1" and written "2/1." A pack made without sugar is called a "no-sugar" pack.

CLASSIFICATIONS

Sales of frozen-pack fruits divide into three markets:

A. Direct sales as raw material to processors, mainly preservers, ice-cream manufacturers, and pie bakers.

B. Wholesale, to small processors and the institutional trade—hotels, restaurants, tea rooms, steamships, dining cars, institutions.

C. Retail, through regular distribution channels, to the home.

Four general classes of packs are now being produced to serve these markets:

1. Barrel-pack.—Fifty-gallon barrels and a comparatively small number of 30-gallon barrels and kegs. This pack goes mainly to preservers and ice-cream manufacturers.

2. Bulk-pack.—A general term applied to fruits packed without sugar in various sizes and kinds of containers suitable for a dry pack. There are three general types of this pack: crate-frozen strawberries and other fruits, practically all used for pies; "single-frozen" berries now being packed in the Northwest, presumably for pies; 30-pound wooden lugs containing frozen blueberries, imported from Canada and used for pies.

3. Intermediate pack, or tin-pack.—Thirty-pound tins and smaller, down to 2½ pounds. Fiber and paper containers are also used. This pack is purchased by the institutional trade and by small processors, to a slight extent by preservers, in larger amounts by ice-cream manufacturers, and quite generally by pie bakers.

4. Retail pack.—Small packages, containing approximately one pound or less for home consumption. Paper cartons, cups, tins, and various other containers are used.

WHY FROZEN-PACK FRUITS ARE USED

Before the advent of cold-pack fruits, preservers were obliged to use canned fruits or confine their operations to the short period when fresh fruits are in season and to plants located in the growing districts.

Cold-pack provides a supply of fresh fruit throughout the year and admits of the location of preserving plants convenient to the preserve market. This avoids operating and labor congestion during the fresh seasons, and reduces overhead by keeping plants and machinery in continuous operation. It also enables the manufacturer to offer the trade a continuous supply of freshly made preserves, and to gauge his production to the demand.

The ice-cream manufacturer and the pie baker can supply a fresh-fruit product the year round. Cold-pack fruit is ready for use; all waste has been eliminated at the source, obviating the necessity for cleaning, grading, and other preparatory operations, for which the processor's regular force is not trained, and which are done by machinery in the cold-packing plant.

Fruit taken directly from the fields, and properly packed and frozen, is of consistently good quality, and is considered by many processors to be superior to the products they get in the fresh-fruit markets, especially in congested districts, where, on account of the delays in delivery and long distances from the fields, an absolutely fresh product is not obtainable. For this reason, cold-pack fruits are used by many pie bakers and ice-cream manufacturers during the fresh-fruit season instead of fresh fruits, especially the early, high-priced fruits.

Due to mass preparation and packing, standardized quality, carlot transportation, and elimination of spoilage in transit, the ultimate cost of cold-pack fruit to the processor is probably less than the average cost of fruits purchased in the fresh-fruit market.

The same general advantages apply to the use of frozen products in the institutional trade and in the home.

FROZEN-PACK FRUIT CONSUMPTION IN THE UNITED STATES

The total consumption of the more important cold-pack fruits in the United States in 1935 was approximately as follows:

Strawberries	42,910,000	pounds
Red sour cherries	16,000,000	"
Red raspberries	8,972,000	"
Blackberries	5,690,000	"
Blueberries	[1]5,100,000	"
Loganberries	2,608,000	"
Peaches	1,300,000	"
Black raspberries	1,107,000	"
Total	83,687,000	"

These figures are based on the *Western Canner and Packer* 1936 Yearbook reports on the northwestern pack in 1935; Michigan Agricultural Experiment Station's report on the 1934 red sour cherry pack, and the 1935 market survey reports of consumption of eastern pack strawberries and peaches, and imported Canadian blueberries. Small packs of eastern fruits other than strawberries and an unestimated amount of frozen sliced apples, are not included.

Taking into account an additional 1,500,000 pounds of miscellaneous fruits cold-packed in the Northwest, and an undetermined amount of fruits other than strawberries, peaches, and cherries, cold-packed in the East, a total consumption of approximately 86,000,000 pounds is indicated.

NORTHWESTERN PRODUCTION OF FROZEN-PACK FRUITS

The Northwestern cold-pack operations are carried on in the states of Oregon and Washington, the bulk of the pack being made in western Washington. The 1935 packs, by the three principal types of containers, and total pounds, are shown in table 1.

The growth of the frozen-fruit industry in the Northwest is shown in table 2. From 1918 to 1926, the production is estimated, but since then accurate records have been kept and the figures are actual.

[1]Of the 5,100,000 pounds of blueberries, 4,500,000 pounds were packed in Canada and New Foundland.

TABLE 1—*Northwestern* 1935 *pack of frozen fruit, by the three principal types of containers.*[1]

Kind of Fruit	450-lb. barrels	30-lb. tins	1-lb. cartons	Total pack
	Pounds	Pounds	Pounds	Pounds
Strawberries	52,526	65,210	845,712	27,610,891
Red raspberries	21,046	20,823	15,432	8,972,298
Loganberries	5,271	3,810	792	2,608,043
Blackberries	11,843	9,423	660	5,290,560
Black raspberries	2,726	1,918	.....	1,107,294
Youngberries	261	1,152	60	149,940
Gooseberries	430	10	.....	138,430
Currants	1,271	180	.....	480,525
Rhubarb	.....	1,025	.....	26,650
Prunes	148	3,236	.....	204,938
Damson plums	3	.....	.....	1,050
Royal Ann cherries	628	.....	.....	270,040
Red sour cherries	1,586	48,779	.....	2,423,663
Black cherries	7	.....	.....	3,010
Grapes	92	.....	.....	31,845
Huckleberries	.....	158	.....	37,657
Sliced apples	.....	500	.....	15,000
Apricots	116	65	.....	58,640
Peaches	55	14	.....	47,062
Total	98,009	156,253	862,656	49,477,536

[1]*Western Canner and Packer* 1936 Yearbook.

TABLE 2—*Production of frozen fruits in the Northwest,* 1918-1935.

Year	Pounds	Year	Pounds
1918	1,200,000	1927	32,466,152
1919	2,000,000	1928	58,883,604
1920	3,200,000	1929	41,674,513
1921	1,200,000	1930	46,731,514
1922	4,000,000	1931	52,462,600
1923	6,000,000	1932	42,732,376
1924	10,000,000	1933	36,377,767
1925	12,000,000	1934	41,307,933
1926	25,564,000	1935	49,477,536

The Northwest is now cold-packing 17 fruits commercially, and has packed 5 more experimentally.

It will be noted that the main production is strawberries and other berries. Berry production centers in the Puyallup Valley in western Washington and the Willamette Valley in western Oregon. Endowed with ideal soil and climatic conditions for berry growing, the Northwest, by its isolation from any considerable fresh market, was forced into making an industry of processing its food products for distribution to the population centers of the Northeast. Naturally, this section was interested in the early experiments in preservation of fruits by freezing, not only because of the threat to its canning business, but as a means of putting its fruits into competition with fresh fruits in the large eastern fresh-fruit markets.

Mr. H. S. Baker, Sr., is credited with making the first cold-pack experiments in Denver, Colorado, in 1908. Three years later, in coop-

eration with local people at Puyallup, Washington, he produced and distributed a commercial pack of berries. In 1912, Baker started packing at Tampa, Florida; following the fruit season to Hammond, Louisiana; to Dayton, Tennessee; then to Norfolk, Virginia; and finally to Michigan. This routine was followed until 1917, when he confined his operations to the Northwest. Like many other northwestern pioneers in the industry, his company is still actively engaged in the business.

It is interesting to note that Tampa, Hammond, and Norfolk are today among the important strawberry-packing centers in the eastern part of the country.

Growers, packers, the U. S. Department of Agriculture, and Oregon and Washington State Colleges cooperated in developing the best possible methods of packing and freezing to meet trade preferences. The Northwest's pack for processors is now the standard by which cold-pack is judged in the markets of the Northeast.

EASTERN PRODUCTION OF FROZEN-PACK FRUITS

The eastern production of frozen-pack fruits, based on consumption reports collected by the market survey and representing an average of the two years 1934 and 1935, was approximately as follows:

Cold-pack strawberries	11,700,000	pounds
Crate-frozen strawberries	3,600,000	"
Red sour cherries[1]	15,000,000	"
Blueberries (Maine pack)	600,000	"
Peaches (estimated)	1,300,000	"
Wild blackberries (Kentucky)	400,000	"
Total	32,600,000	"

Small local packs of red raspberries, blackberries, and other small fruits, as well as an undetermined amount of frozen apple slices, are omitted as being too insignificant in volume to affect the totals materially.

Eastern frozen-pack operations, with the exception of the red sour cherry pack, have not been recorded. The U. S. Department of Agriculture and other Government Departments have no frozen-fruit or vegetable statistics. In fact, where any mention is made of frozen fruits, the data are included with those of preserved fruits. Only a few of the eastern packers whose headquarters were in the cities covered by the survey were interviewed. They were not inclined to give out definite information, and their estimates of their own and their competitors' operations were often irreconcilable.

[1]1934 production—Mich. Agr. Exp. Sta., Special Bul. 258.

Data on the eastern pack of strawberries and other fruits (except cherries) are therefore based on interviews with distributors and users. It is believed that all large users of the eastern barrel-pack were covered by the survey, but it was obviously impracticable to interview all the small users. No attempt was made to cover any but the largest users of the 30-pound tins. Smaller containers were not recorded.

The eastern cold-pack strawberry production, based on the consumption determinations of the market survey, was divided as to variety, origin, and size and number of containers, as shown in table 3.

TABLE 3—*Eastern cold-pack strawberry production.*

Variety	Origin	450-lb. barrels	30-lb. tins
Missionary	Florida, North Carolina, Virginia, Maryland, Delaware	16,895	5,300
Klondike	Louisiana, Alabama, Tennessee	3,833	3,475
Blakemore	North Carolina, Virginia, Maryland	2,145	2,050
Premier	Mainly New York	875	750
Gibson	Mainly New York	800	.....
	Total	24,548	11,575

One eastern packer, who has a high standing in the trade, has established a plant in Florida. Purchasing week-end berries and other berries too ripe for shipment north, he pays a moderate price, but still adds materially to the growers' income, as otherwise these berries would be a total loss. In sorting this stock for cold-packing, he usually discards about one-fourth of the total. He packs in Florida from about the middle of February to the middle of April, and then moves his equipment north and packs berries purchased in the various East-Coast states.

In Louisiana, other packers follow similar methods during the high-priced first pickings, waiting for the latter part of the season and a lower price level for their main pack. In 1936, they are reported to have packed approximately 8,000 barrels.

In North Carolina, berries for cold-pack are purchased at the auction block when the price range is favorable. They are shipped to Norfolk for packing and freezing, or even to Baltimore or Philadelphia. Berries are likewise purchased in Virginia, Maryland, and Delaware when the market is glutted and prices are low, and frozen in Norfolk, Baltimore, or Philadelphia.

Western Tennessee usually packs about 3000 barrels of strawberries and sends them to St. Louis for freezing and storing. In Middle Tennessee, operations have been limited to surplus stock, purchased at low prices, frozen in Nashville, and shipped to the northeastern market. The growers have expressed dissatisfaction with the situation on account of the low prices. Plans are being made to establish packing operations in East Tennessee.

Considered by the eastern growers mainly as an outlet for fruit not saleable in the fresh-fruit market, and usually treated as a more or less important side line by the packers, the eastern strawberry pack, in the opinion of a majority of the consumers interviewed, is not on a par with the northwestern pack.

The criticisms of the eastern pack in general are the presence of sticks, stones, leaves, and other foreign matter; lack of grading as to size, ripeness, or condition; many caps left on; more than one variety of berry in the container; and inaccurate proportions of fruit and sugar.

There is naturally variation in the quality of the eastern pack, depending on the standards of the various packers, the variety and condition of the berries purchased, and the methods of freezing and handling.

One Boston purchaser of cold-pack buys Missionary strawberries which have been frozen in Norfolk, shipped by boat to Boston without refrigeration, and refrozen—a procedure which, he admitted, does not enhance the final quality of the product.

CANADIAN CONSUMPTION AND PRODUCTION OF COLD-PACK STRAWBERRIES

The leading Canadian jam manufacturer, located in Montreal, reported the use of 1000 50-gallon barrels of cold-pack strawberries per year. These were mostly Clark Seedling, packed 2/1 in British Columbia, and costing 8.5 cents to 10.5 cents per pound, delivered in Montreal.

Until recently, his requirements were made up of 400 barrels of the British Columbia pack and 400 barrels of his own pack of imported Tennessee Klondikes. His last importation of U. S. cold-pack strawberries was in 1929.

Fresh strawberries are imported from the United States, paying an import duty of 20 percent, plus 3 percent excise duty, up to June 1, and from June 1 to July 1, a duty of 5 cents per pound.

The strawberries raised in Ontario and Quebec are practically all disposed of in the fresh-fruit market.

The Cooperative Federel of Montreal had a substantial stock of strawberries frozen in 1-pound cups intended for retail. This stock was not selling as well as had been anticipated.

MARKET FOR FROZEN-PACK STRAWBERRIES

Tables 4, 5, and 7 are general summaries of consumption, covering location and extent of market, utilization, varieties of strawberries, and fruit-sugar ratios.

TABLE 4—*Location, consumption, use, and variety of cold-pack strawberries.*[1]

Packed in 450-pound barrels—1935 market survey.

Location	Consumption—No. of barrels				Variety—No. of barrels					
	Total	Preserves	Ice cream	Pies	Marshall	Klondike	Missionary	Blakemore	Premier	Gibson
Louisville	525	450	75	------	450	------	------	------	25	50
St. Louis	4,630	4,500	130	------	1,530	2,500	600	------	------	------
Indianapolis and vicinity	2,083	2,000	83	------	2,050	33	------	------	------	------
Chicago	7,470	6,320	1,150	------	7,470	------	------	------	------	------
Detroit	600	------	600	------	600	------	------	------	------	------
Cleveland	6,725	6,100	625	------	6,025	------	700	------	------	------
Cincinnati	1,720	1,650	70	------	740	580	200	200	------	------
Pittsburgh	3,565	3,150	415	------	1,065	------	1,250	1,250	------	------
Southwestern New York	3,000	3,000	------	------	1,125	------	200	175	750	750
Buffalo	100	------	100	------	100	------	------	------	------	------
Rochester	4,580	4,500	80	------	205	------	4,375	------	------	------
Syracuse	95	------	95	------	95	------	------	------	------	------
Utica	20	------	20	------	------	20	------	------	------	------
Schenectady	15	------	15	------	------	------	15	------	------	------
Boston	5,160	3,800	1,360	------	2,590	200	1,750	520	100	------
New York	18,840	17,200	1,290	350	12,550	500	5,790	------	------	------
Philadelphia	10,150	8,450	1,700	------	8,900	------	1,250	------	------	------
Baltimore	2,975	2,500	475	------	2,500	------	475	------	------	------
Washington	300	------	225	75	150	------	150	------	------	------
Richmond	140	------	140	------	------	------	140	------	------	------
Total	72,693	63,620	8,648	425	48,145	3,833	16,895	2,145	875	800

[1]Fruit-sugar ratio	No. of barrels	Percent of pack
1½/1	2,250	3.1
2/1	48,810	67.0
3/1	12,558	17.5
4/1	8,250	11.5
5/1	825	1.1

TABLE 5—*Location, consumption, use, and variety of cold-pack strawberries.*[1]

Packed in 30-pound tins, reported by consumers and jobbers, together with brokers' estimates—1935 market survey.

Location	Consumption—No. of tins					Variety—No. of tins				
	Total	Preserves	Ice cream	Pies	Hotels	Marshall	Klondike	Missionary	Blakemore	Premier
Indianapolis	1,000	———	1,000	———	———	750	250	———	———	———
Chicago	915	———	650	150	115	190	725	———	———	———
Detroit	11,500	———	750	10,750	———	11,150	———	———	———	———
Cleveland	1,000	———	500	500	———	1,000	———	———	———	———
Cincinnati	2,000	———	500	1,500	———	1,500	500	———	———	———
Pittsburgh	2,750	———	1,175	1,520	55	2,750	———	———	———	———
Buffalo	2,450	———	950	1,500	———	2,450	———	———	———	———
Rochester	1,000	———	———	1,000	———	1,000	———	———	———	———
Syracuse	250	———	———	125	125	250	———	———	———	———
Albany	1,000	———	———	1,000	———	1,000	———	———	———	———
Boston	6,300	———	1,800	2,500	2,000	3,800	———	1,200	1,300	———
New York	12,400	800	100	5,400	6,100	6,800	———	4,100	750	750
Philadelphia	3,000	———	———	2,000	1,000	3,000	———	———	———	———
Baltimore	2,500	———	———	1,500	1,000	2,500	———	———	———	———
Washington	2,000	———	2,000	———	———	———	2,000	———	———	———
Total	50,065	800	9,425	29,445	10,395	38,140	3,475	5,300	2,050	750

[1]Fruit-sugar ratio	Number of tins	Percent of pack
2/1	650	1.2
3/1	24,890	50.0
4/1	16,275	32.5
5/1	6,000	12.0

Table 4 covers 450-pound barrels reported in interviews with processors and checked for accuracy against reports and estimates by brokers and executives of cold-storage warehouses holding frozen-pack in the various consumption centers. The average barrel pack of northwestern Marshall strawberries for the two years 1934 and 1935 was 49,506 barrels. The survey total is 48,145 barrels of Marshall, indicating a coverage of approximately 95 percent of the average Marshall pack. No check can be made against coverage for the eastern pack, as no records of the amount packed were available.

Practically all barrel-pack strawberries are used for processing; 87.5 percent by preservers, 12 percent by ice-cream manufacturers, and 5 percent by pie bakers. Small quantities are used for fruit juice and flavoring extracts.

Table 5, covering 30-pound tins, is based on quantities reported by the larger consumers and jobbers and estimates made by cold-pack brokers. It is incomplete because of the impossibility of interviewing the many small users. It gives, however, a fairly accurate indication of the division into consumer classes, varieties, and types of pack. The pie baker is an important user of 30-pound tins, accounting for 29,500 of the 50,000 tins, or approximately 60 percent.

Table 6, covering the northwestern cold-pack of strawberries, by size of container, for 10 years, 1926 to 1935, inclusive, gives the best available information as to relative consumption by size of containers. The proportions from year to year are affected, however, by carry-overs, as well as by fluctuating commercial conditions.

TABLE 6—*Pacific Northwest cold-pack strawberries, by size of containers* —1926-35.[1]

Year	50-gallon barrels	30-pound tins	15-pound tins	10-pound tins
1926	32,332	.....	.....	.....
1927	53,828	25,402	.....	.....
1928	73,544	242,714	21,940	32,644
1929	53,382	80,483	15,460	28,639
1930	40,519	36,571	4,369	3,246
1931	66,825	64,997	6,629	12,246
1932	65,559	68,187	11,130	64,012
1933	39,784	26,960	3,570	512
1934	46,487	57,876	6,320	15,128
1935	52,526	65,210	14,456	11,179

[1]*Western Canner and Packer* 1936 Yearbook.

Table 7, covering crate-frozen consumption, is incomplete, as only large pie bakers were interviewed and a relatively large part of the consumption is in scattered small lots. There were 56,650 crates reported during interviews. A review of the estimates made by the trade indicated that 100,000 crates, approximately 3,600,000 pounds, would be a conservative total.

TABLE 7—*Crate-frozen strawberries used by leading wholesale pie bakers.*

1935 market survey.

Location	No. of crates	Variety	Source	Chicago brokers' estimates	
St. Louis	500	Any	Local		
Indianapolis	400	Klondike	———	Chicago	25,000
Chicago	25,650	Klondike	Local	Philadelphia	30,000
		Klondike		Pittsburgh	20,000
Detroit	6,500	Various	Local	Detroit	5,000
Pittsburgh	500	———	———	Baltimore	15,000
New York	23,100	Klondike	———	New York City	10,000
		Missionary		Boston	5,000
Total	56,650	———	———	Total	110,000

These crate-frozen berries usually represent surplus stock bought on the local fresh market at a low price and frozen without sorting or capping, and, of course, without sugar. An undetermined amount is purchased and frozen in the strawberry-growing sections. They are all eastern berries, often of unknown variety or original source. If there are any preferences as to variety they are Missionary in the East and Klondike in the Midwest.

The berries are usually cleaned and capped while frozen, just before using. One large pie baker, however, using approximately 600,000 pounds per year, buys his crate-frozen berries capped and cleaned before freezing, ready for use.

All cities reported the use of tin and crate-frozen packs to some extent, but the consumption has not been included where it is small and scattered.

FRUIT-SUGAR RATIO — COLD-PACK STRAWBERRIES

Preservers and ice-cream manufacturers prefer the 2/1 pack because they are convinced this mixture more nearly retains the flavor, color, and texture of the fresh berry. Experiments at the Massachusetts Experiment Station and elsewhere bear out this belief.

From time to time, the question of the keeping qualities of the various packs has been brought up. A prominent cold-pack broker in Chicago expressed the opinion that, other factors being equal, when stored at 15° F., packs of the various fruit-sugar ratios have keeping qualities as follows:

1/1	Indefinite
2/1	2 to 3 years
3/1	6 months
4/1	4 months

TABLE 8—*The important markets for frozen-pack strawberries, as determined by the 1935 market survey.*

Location	Barrel-pack	Tin-pack	Crate-frozen	Total
	Pounds	Pounds	Pounds	Pounds
Louisville	236,250	.....	.....	236,250
St. Louis	2,083,500	.....	18,000	2,101,500
Indianapolis and vicinity	937,350	30,000	14,400	981,750
Chicago	3,361,500	27,450	923,400	4,312,350
Detroit	270,000	345,000	234,000	849,000
Cleveland	3,026,250	30,000	.....	3,326,250
Cincinnati	774,000	60,000	.....	834,000
Pittsburgh	1,604,250	82,500	18,000	1,704,750
Southwestern N. Y. State	1,350,000	.....	.....	1,350,000
Buffalo	45,000	73,500	.....	118,500
Rochester	2,061,000	30,000	.....	2,091,000
Central N. Y. State	58,500	37,500	.....	96,000
Boston	2,322,000	189,000	.....	2,511,000
New York	8,478,000	372,000	831,600	9,681,600
Philadelphia	4,567,500	90,000	.....	4,657,500
Baltimore	1,338,750	75,000	.....	1,413,750
Washington	135,000	60,000	.....	195,000
Richmond	63,000	.....	.....	63,000
Total	32,711,850	1,501,950	2,039,400	36,253,200

No records of experimental work which would substantiate this opinion could be located, but several consumers stated that they would buy 3/1 pack for use within six months and 2/1 for longer storeage, when they could get the former at a lower price.

Many leading ice-cream manufacturers buy 2/1 pack, claiming the fruit does not freeze as hard and the mixture is less acid than when less sugar is used; also that both the color and flavor are more nearly like fresh fruit.

The preference of the 30-pound tin users for less sugar may be due to the fact that the tin-pack is sold at higher prices than the barrel-pack, mostly to small users, who object to paying from 10 to 15 cents per pound for more sugar than is necessary. They strike a balance between cost and quality and favor the 3/1 pack.

The selling prices of the various packs are somewhat dependent upon the relative prices of berries and sugar. In 1935, when the cost of the berries was 5 cents per pound, the northwest opening prices on cold-pack in 50-gallon barrels were as follows:

No sugar	7½	cents
3/1	7¼	"
2/1	7	"

ORIGIN AND VARIETIES OF FROZEN-PACK STRAWBERRIES AND DISTRIBUTION IN THE MARKET

Figures 1, 2, 3, and 4 show the production centers from which the barrel-pack of the four recognized cold-pack varieties, Marshall, Missionary, Klondike, and Blakemore, flow into the consuming markets.

Figure 1 shows 48,145 barrels of Marshall grown in the Northwest, dominating the midwestern and northeastern markets, with a fairly uniform distribution in comparison with the total cold-pack used.

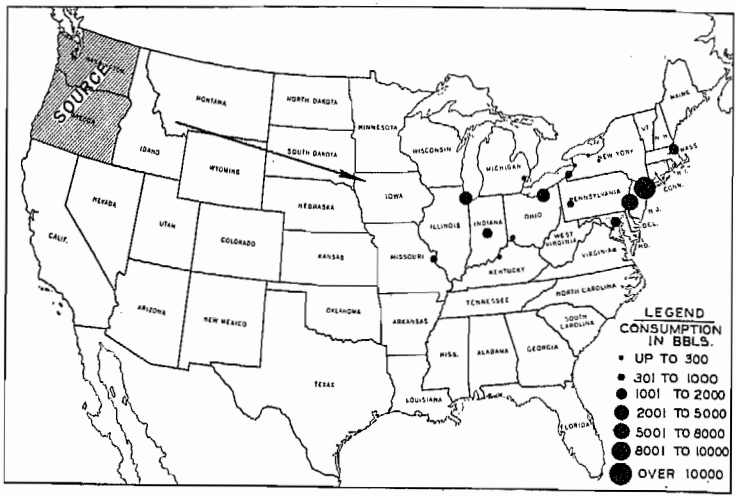

Figure 1—Source, distribution, and consumption of cold-pack Marshall strawberries, packed in 450-pound barrels, as covered by 1935 market survey.

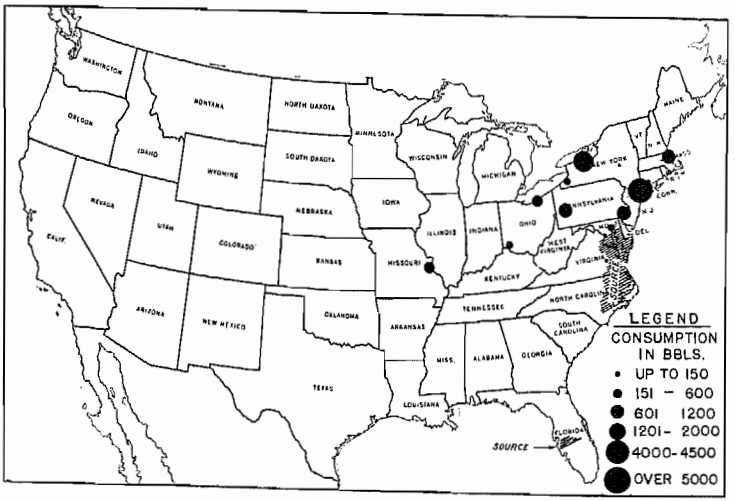

Figure 2—Source, distribution, and consumption of cold-pack Missionary strawberries, packed in 450-pound barrels, as covered by 1935 market survey.

Figure 2 shows 16,895 barrels of Missionary, originating in the Middle Atlantic States—North Carolina, Virginia, and Maryland—distributed generally in the Northeast, mainly in New York City and Rochester, with secondary consumption in Boston, Philadelphia, and Pittsburgh.

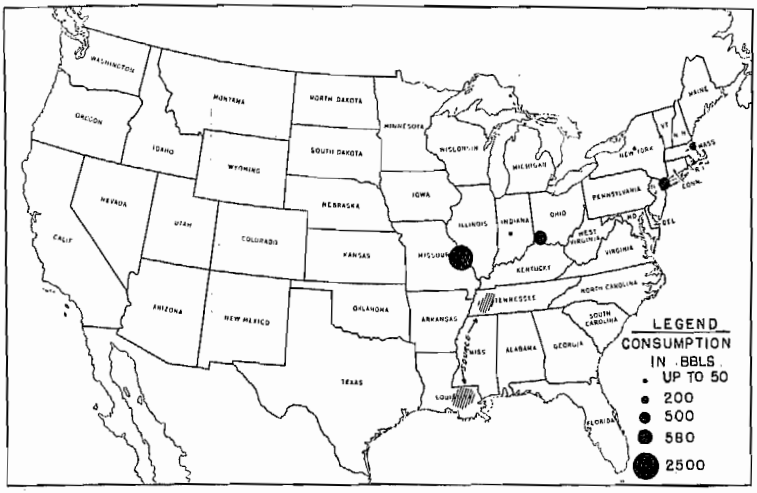

Figure 3—Source, distribution, and consumption of cold-pack Klondike strawberries packed in 450-pound barrels, as covered by 1935 market survey.

Figure 3 shows 3,833 barrels of Klondike, mainly from Louisiana and West Tennessee, moving north into St. Louis, and to a small extent into Cincinnati, New York, and Boston.

Figure 4—Source, distribution, and consumption of cold-pack Blakemore strawberries, packed in 450-pound barrels, as covered by 1935 market survey.

Figure 4 shows 2,145 barrels of Blakemore, packed in the same general locality as Missionary—North Carolina, Virginia and Maryland—concentrating in Pittsburgh, with a secondary market in Boston.

TABLE 9—*Cold-pack strawberries consumed by preserving industry—distribution by variety and type of pack.*
Packed in 450-pound barrels—1935 market survey.

Location	Consumption No. of barrels	Variety—No. of barrels						Type of pack (fruit/sugar ratio)				
		Marshall	Klondike	Missionary	Blakemore	Premier	Gibson	1½/1	2/1	3/1	4/1	5/1
Louisville	450	400	———	———	———	———	50	———	400	50	———	———
St. Louis	4,500	1,400	2,500	600	———	———	———	———	4,500	———	———	———
Indianapolis and vicinity	2,000	2,000	———	———	———	———	———	———	2,000	———	———	———
Chicago	6,320	6,320	———	———	———	———	———	———	6,120	200	———	———
Detroit	———	———	———	———	———	———	———	———	———	———	———	———
Cleveland	6,100	5,400	———	700	———	———	———	———	4,600	1,500	———	———
Cincinnati	1,650	700	550	200	200	———	———	———	1,650	———	———	———
Pittsburgh	3,150	650	———	1,250	1,250	———	———	———	2,750	400	———	———
Southwestern New York	3,000	1,125	———	200	175	750	750	———	3,000	———	———	———
Buffalo	———	———	———	———	———	———	———	———	———	———	———	———
Rochester	4,500	125	———	4,375	———	———	———	2,250	2,250	———	———	———
Boston	3,800	1,850	200	1,350	300	100	———	———	2,100	200	750	750
New York	17,200	11,000	500	5,700	———	———	———	———	9,950	5,250	2,000	———
Philadelphia	8,450	8,200	———	250	———	———	———	———	2,000	950	5,500	———
Baltimore	2,500	2,500	———	———	———	———	———	———	2,500	———	———	———
Total	63,620	41,670	3,750	14,625	1,925	850	800	2,250	43,820	8,550	8,250	750

TABLE 10—*Cold-pack strawberries consumed by ice-cream industry—distribution by variety and type of pack.*
Packed in 450-pound barrels—1935 market survey.

Location	Consumption No. of barrels	Variety—No. of barrels						Type of pack (fruit/sugar ratio)	
		Marshall	Klondike	Missionary	Blakemore	Premier	Gibson	2/1	3/1
Louisville	75	50	.....	.....	.....	25	.....	75	.....
St. Louis	130	130	.....	.....	.....	.....	.....	130	.....
Indianapolis and vicinity	83	50	33	.....	.....	.....	.....	.....	83
Chicago	1,150	1,150	.....	.....	.....	.....	.....	1,150	.....
Detroit	600	600	.....	.....	.....	.....	.....	600	.....
Cleveland	625	625	.....	.....	.....	.....	.....	525	100
Cincinnati	70	40	30	.....	.....	.....	.....	30	40
Pittsburgh	415	415	.....	.....	.....	.....	.....	310	105
Buffalo	100	100	.....	.....	.....	.....	.....	100	.....
Rochester	80	80	.....	.....	.....	.....	.....	50	30
Syracuse	95	95	.....	.....	.....	.....	.....	95	.....
Utica	20	.....	20	.....	.....	.....	.....	20	.....
Schenectady	15	.....	.....	15	.....	.....	.....	.....	15
Boston	1,360	740	100	300	220	.....	.....	940	420
New York	1,290	1,200	.....	90	.....	.....	.....	200	1,090
Philadelphia	1,700	700	.....	1,000	.....	.....	.....	.....	1,700
Baltimore	475	.....	.....	475	.....	.....	.....	475	.....
Washington	225	150	.....	75	.....	.....	.....	150	75
Richmond	140	.....	.....	140	.....	.....	.....	140	.....
Total	8,648	6,125	183	2,095	220	25	.....	4,990	3,658

In addition to the above varieties, table 4 covers 1,675 barrels of Gibson and Premier berries. These were mainly grown and processed in western New York. A few other varieties were grown, packed, and used locally.

The 30-pound tin-pack follows the same general trends as the barrel-pack. The crate-frozen pack, however, consists entirely of eastern berries, usually of undetermined variety.

STRAWBERRY VARIETIES NOW COLD-PACKED FOR THE PRESERVE AND ICE-CREAM INDUSTRIES

Figures 5 and 6 and tables 9 and 10 show the distribution of varieties in the preserve and ice-cream industries in the various processing centers, as covered by the 1935 market survey.

The predominance of Marshall is obvious, especially in the preserve industry. Positive statements were made by many processors that it is the only cold-pack berry they have found suitable for their work, and that they will consider no other. Other processors, however, were less positive, and a few indicated decided preferences for Klondike, Missionary, or Blakemore, provided good packs of these eastern berries could be obtained.

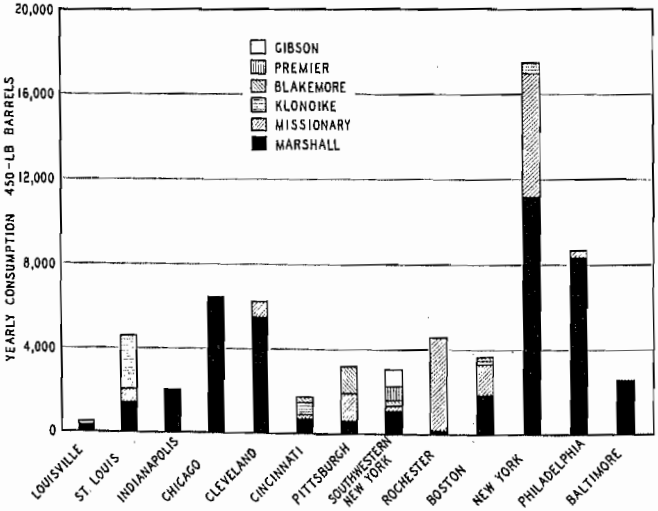

Figure 5—Cold-pack strawberries, packed in 450-pound barrels, consumed by preserve manufacturers, showing location, volume, and varieties of strawberries, as covered by the 1935 market survey.

As a matter of fact, Missionary is being used satisfactorily in preserves in Pittsburgh, Rochester, Boston, and New York City, and in ice cream in Boston, Philadelphia, and Baltimore. Preservers, lo-

cated in Baltimore, one of the largest Missionary-packing centers, use Marshall; but the Baltimore ice-cream manufacturers use Missionary. In Philadelphia, another important Missionary-packing center, this variety has made little impression on the preserving trade, but dominates the ice-cream industry.

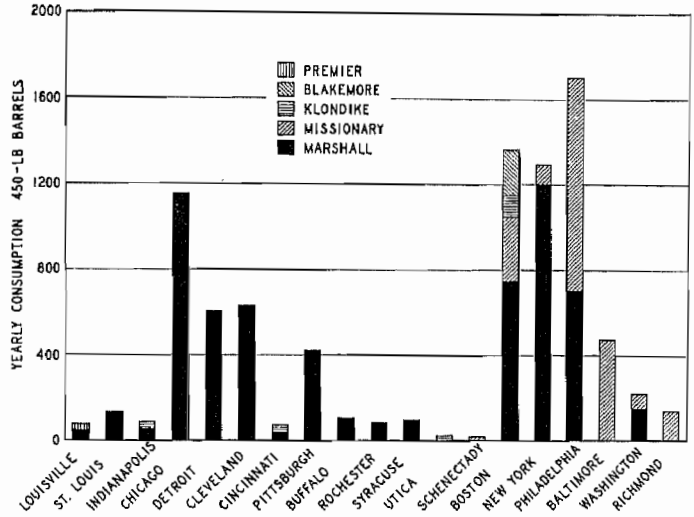

Figure 6—Cold-pack strawberries, packed in 450-pound barrels, consumed by the leading ice-cream manufacturers, showing location, volume, and varieties of strawberries, as covered by the 1395 market survey.

Klondike is used for preserves mainly in St. Louis and Cincinnati, but appears in New York and Boston. Its geographical origin may be in part responsible for this distribution. Packed in barrels, however, it appears in ice cream mainly in Boston. Crate-frozen for pies, it seems to predominate in Chicago.

Blakemore makes a good showing in the preserve industry in Pittsburgh, and to a small extent is used in Cincinnati, western New York, and Boston. Practically its only extensive use in ice cream is in Boston.

STRAWBERRY CHARACTERISTICS FOR FROZEN-PACK

Reviewing the opinions expressed during the market survey, the following composite specifications describe the ideal strawberry for preserving:

A firm berry; of good flavor; of bright-red color; colored throughout, with no white sections; of high acid content, so it will jell more easily and require less cooking to evaporate the necessary amount of moisture, and therefore give a higher yield of preserves per barrel of fruit. Berries to be closely graded, ⅝-⅞ inch in size

(measured across widest part); and to be uniformly ripened, clean, and packed in an accurately proportioned amount of sugar.

The Department of Agriculture[1] states that "Varieties for preserving should be easy to cap, medium-sized, firm, and have a high flavor and a light, bright-red color that does not turn dark after preserving . . . . Because of the low cost of production and the steady supply, the larger part of the berries for preserving and the ice-cream trade are packed in Oregon and Washington and are of the Marshall variety."

The four varieties of strawberries now used for cold-pack are described as follows:

Marshall.—Berry large, irregular round conic to conic, soft, deep crimson with dark-red flesh, subacid, quality best.

Missionary.—Berry medium size to large, conic, soft to very firm according to section in which it is grown, dark crimson with dark-red flesh, acid, quality fair to good.

Klondike.—Berry medium size, round or round conic (except California, where it is necked), very firm, deep crimson to center, acid, quality fair to good.

Blakemore.—Berry medium large, blunt conic, firm, bright, light-red flesh, seeds yellow, flesh subacid, quality good.

Western Canner and Packer states that "Marshalls and Improved Oregons usually are devoted to freezing, being considered too large and soft for general canning purposes."

The Klondike, Missionary, and Blakemore seem more nearly to meet the requirements than the Marshall. Farmers' Bulletin 1043 says, "The best preserving sort is the Blakemore," although the Blakemore is listed as subacid and the yellow seeds might not be especially desirable in preserves.

An official of the National Preservers Association expressed the opinion that Tennessee Klondike and Blakemore, if properly packed, should have a good market in the preserving trade. He considered Blakemore particularly good. The Premier is not satisfactory, as it goes to pieces during cooking, but should be suitable for the ice-cream trade. He also stated that he knew of no eastern or southern pack that was in the same class with the northwestern Marshall.

The chief chemist of one of the largest preserve manufacturing plants said he was familiar with the characteristics of both the Klondike and the Blakemore, and that either of them could be used as well as the Marshall.

[1]Farmers' Bulletin 1043, p. 18.

Officials of several prominent preserving companies asked that they be advised if a high-grade pack of Tennessee Klondike or Blakemore is put on the market. And one leading preserver in the Pittsburgh area said he would use Blakemore exclusively if he could locate a reliable source of supply.

Many other important preservers who recognized the possibility that the Klondike or Missionary would equal if not exceed the Marshall for preserves, stated that they had found it impossible to get a clean, reliable pack. Several said they would use Blakemore if they could get it.

Leading brokers in the main consuming districts asked for an opportunity to represent Tennessee accounts if Tennessee decided to offer a pack as good as that now produced in the Northwest. Which indicates that they believe Tennessee berries can compete with the northwestern Marshall in quality if properly packed.

A Chicago preserver stated that the northwestern growers were experimenting with different varieties of strawberries to replace the Marshall, and that the most promising for cold-pack was the Corvallis, which was more acid than the Marshall and would be better for preserving. It was also reported that the Corvallis produced a much higher yield per acre than the Marshall.

The ice-cream manufacturers in general showed a preference for a berry of rich color and high flavor, with subacid flesh. They differ from the preservers in wanting richer color and less acid, and in their willingness to accept larger berries because the fruit is thoroughly pulped in the ice-cream mix. They also like a berry which does not freeze too hard.

Pie bakers prefer a medium-sized berry, of bright color, high acid content, and good flavor, which will not disintegrate when baked.

COLD-PACK RED RASPBERRIES

The market for cold-pack red raspberries, as determined by the market survey, is summarized in table 11.

The Northwest reported a pack of 25,534 barrels in 1934 and 21,046 in 1935—an average of 23,290 barrels for the two years.

No attempt was made to locate all the 30-pound tins, but their distribution was determined to be mainly to hotels and restaurants and the institutional trade in general, where they are used for pies, ice cream, and ices.

The preserving trade counts on a consistent consumer demand for red raspberry preserves equivalent to approximately one-third of the demand for strawberry preserves.

TABLE 11—*Location, consumption, and use of cold-pack*[1] *red raspberries.*[2]
Packed in 385-pound barrels—1935 market survey.

Location	Consumption—No. of barrels		
	Total	Preserves	Ice cream
Louisville	50	50	.....
St. Louis	655	650	5
Indianapolis and vicinity	2,500	2,500	.....
Chicago	2,860	2,850	10
Cleveland	3,430	3,425	5
Cincinnati	225	225	.....
Pittsburgh	800	800	.....
Rochester	225	225	.....
Boston	2,678	2,670	8
New York	6,765	6,750	15
Philadelphia	1,645	1,570	75
Baltimore	750	750	.....
Washington	18	.....	18
Total	22,601	22,465	136

[1]Type of pack—fruit/sugar ratio:

No sugar	18,550	barrels
2/1	28	"
3/1	3,883	"
4/1	140	"

[2]All were Cuthbert from Northwest, except the 18 barrels of eastern pack located in Washington, D. C.

The red raspberry is well adapted for packing without sugar. Some eastern preservers stated that they specify the no-sugar pack for use within 3 to 6 months after packing, but for longer periods use the 3/1 pack.

The survey uncovered a minor use for frozen pureed red raspberries by the ice-cream industry, for both ice cream and ices. One manufacturer reported, however, that he had discontinued using the pureed raspberries, as the lack of seeds leads to his being accused of using artificial red raspberry flavoring.

TABLE 12—*Pacific Northwest cold-pack red raspberries, by size of containers*—1926-35.[1]

Year	50-gallon barrels	30-pound tins	15-pound tins	10-pound tins
1926	35,902	.....	.....	.....
1927	10,699	10,903	.....	.....
1928	28,148	10,937	220	8,350
1929	17,015	6,922	628	780
1930	30,111	20,359	1,854	3,094
1931	25,385	21,095	1,078	646
1932	9,881	7,231	1,571	616
1933	22,326	10,450	1,174	1,100
1934	25,534	13,611	2,645	692
1935	21,036	20,823	3,488	2,924

[1]*Western Canner and Packer* 1936 Yearbook.

In 1935, the total northwestern red raspberry pack, 8,972,298 pounds, in all-size containers, was approximately 32 percent of the northwestern strawberry pack, and 23 percent of the total strawberry pack.

COLD-PACK BLACKBERRIES

The market for cold-pack blackberries, as determined by the market survey, is summarized in table 13.

TABLE 13—*Location, consumption, variety, source, and type of pack of frozen blackberries.*[1]

Packed in 385-pound barrels—1935 market survey.

Location	Consumption No. of barrels	Variety	Source	Pack
Louisville	146	Evergreen	Northwest	No sugar
St. Louis	400	"	"	"
Indianapolis and vicinity	600	"	"	"
Chicago	325	"	"	"
Cincinnati	1,050	Wild	Kentucky	2/1, 3/1, 4/1
Pittsburgh	600	Evergreen	Northwest	No sugar
Boston	100	"	"	"
New York	2,050	"	"	"
Philadelphia	[2]1,230	"	"	"
Total	6,501			

[1]All cold-pack blackberries located were consumed by preserving industry.
[2]Includes 30 barrels of Black Diamond variety packed in the East. No sugar.

The Northwest reports 3,685 barrels of cold-pack blackberries in 1934 and 11,843 in 1935, an average of 7,764 for the two years.

The 30-pound tin-pack distribution is in general the same as that of the red raspberry—to the institutional trade for pies, ice cream, and desserts. Fruit-sugar ratio was mostly 2/1.

Preservers in Cincinnati stated that they could use additional quantities of cold-pack wild blackberries if they could get them, and two preservers in Pittsburgh stated that they could use wild blackberries; one mentioning 200 barrels and the other 300 to 400 barrels. The latter, now using 400 barrels of northwestern Evergreen, would use the eastern Eldorado if a good cold-pack were available.

TABLE 14—*Pacific Northwest cold-pack blackberries, by size of containers* —1926-1935.[1]

Year	50-gallon barrels	30-pound tins	15-pound tins	10-pound tins
1926	8,308	.....	.....	.....
1927	1,788	3,508	.....	.....
1928	7,250	.....	200	276
1929	6,484	.....	508	
1930	6,142	8,517	437	358
1931	4,169	8,984	402	
1932	4,092	9,062	784	52
1933	3,846	10,227	100	26
1934	3,685	4,066	1,825	50
1935	11,843	9,423	2,201	816

[1]*Western Canner and Packer* 1936 Yearbook.

Blackberries constitute the third most important cold-pack berry, from the volume standpoint, the total northwestern pack for 1935 amounting to 5,290,560 pounds, or approximately 19 percent of the northwestern strawberry pack.

With almost the total cold-pack of blackberries used by preservers, the position of blackberries in the cold-pack industry is obviously dependent on their status in the preserve trade. Blackberry preserves were estimated at 6.27 percent of the total preserve production in 1930.

COLD-PACK YOUNGBERRIES

The first report on youngberries, made by the Northwest in 1935, covered a total of 149,940 pounds, consisting of 261 barrels, 1,152 30-pound tins, and 60 1-pound cartons. Previously the youngberry statistics had been combined with those of dewberries and miscellaneous berries.

The only cold-pack youngberries located by the market survey were for experimental use and had been packed in the Northwest. They were being tried out by pie bakers and preserve manufacturers.

A Chicago pie baker stated that youngberries were satisfactory for pies, but that there was little demand for them, as they were not known.

A Baltimore broker was distributing a small lot of 300 30-pound tins, packed 5/1, to pie bakers, but had no reports at the time of the interview. The selling price was 8½ cents per pound, delivered in Baltimore.

Buffalo and Pittsburgh jobbers were trying out a few 30-pound tins, but had no reports as to results.

A large eastern preserver experimented with youngberries for preserves. The color was good and the preserver considered that they could be used as blackberries at the same price, but was not interested in offering them as a new line of preserves.

A Philadelphia preserver experimented with two 50-gallon barrels, which were packed without sugar and cost 8½ cents per pound delivered in Philadelphia. He had not determined the results at the time of the interview.

A number of jobbers, preservers, and ice-cream manufacturers expressed an interest in youngberries and a desire to try them out.

The preservers were interested in the youngberry as a substitute for the blackberry because it has a smaller seed content and the seeds are not so hard. It would probably have to be sold at blackberry prices for this use.

The *Western Canner and Packer* Yearbook for 1936 says the youngberry, as well as the loganberry and dewberry, is simply another variety of blackberry, and is, therefore, not a hybrid. This publication points to an increased interest in the youngberry as a canned fruit and is apparently trying to promote interest in it for cold-pack use.

COLD-PACK PEACHES

Peaches are second to strawberries in importance as a fruit crop in Tennessee. Although peaches are among the most popular fruits in the fresh market and a leading fruit in the canning industry, there has been no extensive successful cold-pack peach operation.

TABLE 15—*Location, consumption, variety, source, and type of pack of frozen peaches.*

Packed in 450-pound barrels, for ice cream—1935 market survey.

Location	No. of barrels	Variety	Source	Pack
St. Louis	8	Elberta	Georgia	3/1
Cincinnati	27	----------	----------	3/1
Rochester	6	----------	----------	----------
Syracuse	4	Elberta Ga. Belle	Georgia	2/1
Boston	20	Elberta	Georgia	3/1
New York	50	----------	Georgia	4/1
Philadelphia	1400	Elberta Ga. Belle	Georgia	3/1
Baltimore	105	Elberta	Georgia	3/1
Washington	90	Elberta Ga. Belle	Georgia Georgia	3/1
Richmond	50	Elberta Ga. Belle	North Carolina	2/1
Total	1760			

Notes.—Type of pack—fruit/sugar ratio:

3/1	1656
2/1	54
4/1	50

No consumption reported by preserve and pie trades.

The present utilization of cold-pack peaches, as determined by the market survey, is summarized in table 15. Of the 1760 barrels located, all but 50 were reported as originating in Georgia but packed outside the state. No Georgia pack was reported during the survey. The only northwestern pack located was a trial lot of 5-gallon tins, packed 3/1 for ice cream, found in Chicago. One preserver in the Midwest reported using 70,000 pounds of California peaches packed 2/1 in 6½-pound tins.

The Northwest reported a cold-pack of 47,062 pounds in 1935, which is their highest recorded pack.

All of the 1760 barrels located were used for ice cream. Peaches rank second to strawberries as a popular fruit flavor in the ice-cream industry. All trades reported the use of fresh peaches in season, but some manufacturers use canned peaches exclusively, and others limit their operations to the fresh-peach season.

There are no available records of the eastern peach pack, and the packers interviewed were unwilling to give definite information as to the volume of their operations. One of the leading packers, who supplies the ice-cream trade with eastern cold-pack fruits, stated that he packed an average of 1000 barrels of Georgia peaches per year. As no uniform method of distribution is followed—many small lots being sold direct to processors—brokers and wholesalers have no comprehensive figures. Several ice-cream companies put up their own cold-pack in miscellaneous containers, buying surplus stock in their local fresh-fruit markets. The best trade opinions indicate a total pack of 3000 to 4000 barrels per year.

The varieties reported were Elberta and Georgia Belle.

Several small lots of 30-pound tins were located in various consuming centers, and these were usually packed 3/1. Some of the small pie bakers were using 4/1 and 5/1 packs.

The ice-cream manufacturers, who require a good color and flavor, consistently use the 3/1 pack. One lot of 1400 1-gallon tins of vacuum cold-pack was packed 3/1.

OXIDATION OF COLD-PACK PEACHES

Officials of the preserve and ice-cream industries repeatedly complained of the discoloration of the cold-pack peach due to oxidation. This seems to be the main obstacle to a much wider use. More complaints were encountered throughout the Midwest than in the Northeast. So far as the ice-cream trade is concerned, this may be due to the fact that in the Midwest there is a consumer demand for fresh-fruit flavors nearly all the year, while in the East and Northeast the demand is limited mainly to the fresh-fruit season. For this reason the cold-pack peaches are used in the East shortly after being packed and do not undergo as long a storage period as in the Midwest.

The vacuum cold-pack method was generally considered the only certain preventive of oxidation, but it was believed to be too expensive.

An ice-cream company in Chicago had a small quantity of Michigan vacuum cold-pack peaches which were two years old and in excellent condition, with no discoloration, and of fine flavor. The cost, delivered in Chicago, had been $8.00 per dozen gallon cans. The pack and price were considered satisfactory, but the packer had gone out of business, and the pack was no longer obtainable. This was a 3/1 pack.

Some packers are said to mix a small percentage of citric acid in the pack and to have other "secret" methods of preventing discoloration.

UNFILLED MARKETS FOR COLD-PACK PEACHES

Many ice-cream and preserve manufacturers voluntarily stated they would use cold-pack peaches if they could obtain a high-grade pack of good color and flavor.

The figures of table 16 include the sugar contained in the pack; and as the usual pack is 3/1, approximately 75 percent of the total represents net weight of fruit, or approximately 1,055,000 pounds of peeled and pitted peaches.

TABLE 16—*A summary of the unfilled market for cold-pack peaches.*

Location	Preserves	Ice cream	Pies
	Pounds	Pounds	Pounds
Louisville	70,000	13,500	------
St. Louis	700,000	13,500	------
Chicago	275,000	45,000	------
Detroit	------	13,000	------
Cleveland	------	45,000	------
Pittsburgh	------	25,000	6,000
Western New York	200,000	8,000	------
Total[1]	1,245,000	158,000	6,000

[1]Total, 1,409,000 pounds—approximately 3,350 450-pound barrels.

Taking into consideration the general use of other cold-pack fruits in the preserve and ice-cream industries, for replacing canned and fresh fruits, a substantial potential market is indicated for a high-quality dependable peach pack.

PRICES OF COLD-PACK PEACHES

Table 20, which recapitulates the average delivered prices for barrels and tin-packs, as reported by users in the cities covered by the market survey, shows an average delivered price of cold-pack peaches in 50-gallon barrels of 10.1 cents per pound.

The prices vary from a maximum of 15 cents in Cincinnati to a minimum of 7.5 cents in Baltimore and Washington. The trade explains this difference as being due to small-quantity shipments from the peach-packing centers of the East. Also the Cincinnati figures apply to the previous year's pack (1934) and include accumulated storage charges, while the eastern figures apply to the 1935 pack, which had been stored for only a short time.

It will be noted that the reported price of the 30-pound tin-pack, 9.9 cents per pound, is slightly less than the 10.1 cents reported for the barrel-pack. This is not consistent with records of other cold-pack fruits, the price usually increasing about ¾ cent per pound for each drop to a smaller-sized container.

COLD-PACK CHERRIES

Cold-pack cherries are divided into three classes: Red Sour, Royal Ann (white sweet), and Black (black sweet). The Northwest

TABLE 17—*Allocation of frozen- and canned-packs in the leading sour cherry-producing states,* 1934.[1]

State	Cold-pack	Canned-pack
	Pounds	Pounds
New York	10,400,000	13,200,000
Michigan	1,600,000	38,800,000
Wisconsin	2,600,000	6,000,000
Ohio and Pennsylvania	400,000	800,000
Total	15,000,000	58,800,000
Oregon, Washington, Idaho (estimated)	1,000,000	4,300,000
Total	16,000,000	63,100,000

[1]Mich. Agr. Exp. Sta., Special Bul. 258.

reported 270,000 pounds of Royal Ann, 3,000 pounds of Black, and 2,423,663 pounds of Red Sour, packed in 1935.

The main red sour pack is made in the Northeast.

A complete survey of the cold-pack cherry market was not made, but interviews with users and distributors covered 9,350 50-gallon barrels, 43,500 30-pound tins, and approximately 6,000 smaller tins of cold-pack, amounting in all to about 5,500,000 pounds, or about one-third of the total 1934 cold-pack of 16,000,000 pounds.

Of the total quantity covered by the survey, 87.5 percent was consumed by the pie industry, 11.5 percent by the preserve industry, and the remainder by the ice-cream industry. A packer who packed an average of 4,000 barrels per year in Michigan and Ohio stated that 90 percent of his sales went to the pie industry and 10 percent to the preserve industry.

The survey indicated that almost the entire pack consisted of the Montmorency red-sour cherry, with only a few scattered reports of the use of the Early Richmond.

SUGAR RATIO

Practically all the important users of cold-pack cherries who were interviewed stated they were using 4/1 pack. A few reported 3/1 and 5/1 pack, in both barrels and tins.

While the Northwest has only a minor position in the cold-pack cherry industry, it is interesting that their 1935 pack of red-sour cherries was the largest on record, consisting of 1586 50-gallon barrels and over 48,000 30-pound tins — a total of 2,423,663 pounds, and more than double that of 1934.

TRENDS IN COLD-PACK CHERRIES

In Michigan Station Special Bulletin 258, published in February, 1935, Roy E. Marshall presents a complete study of "Production and Price Trends in the Pitted Red Cherry Industry," and it is especially interesting as indicating that cold-pack cherries have gone through the same cycle as other cold-pack operations: over-enthusiasm, overproduction, large carryovers, low prices, and recovery to a healthy and steadily increasing market.

"The prices at which processed red cherries sell will be very largely governed by competition from other fruits and commodities used as pie fillers," is a comment equally significant with respect to other cold-pack fruits for the pie trade.

SWEET CHERRIES

The use of the sweet cherry for cold-pack is negligible. The market survey found a shortage of white sweet cherries for utilization as

Maraschino pack. These cherries had been largely imported from Italy, but increased tariff rates favored the domestic cherry, and production apparently had not caught up with demand. Cherries for this purpose are preserved in brine, bleached, and artificially colored when processed. The white Royal Ann is preferred, but the shortage in white sweet cherries had forced the use of the Montmorency red-sour cherry, which, on account of its softness, is said to produce an inferior product. Brined cherries are also utilized for glace cherries and in canning for salad or fruit cocktail, which comparatively new use in conjunction with short crops of Royal Anns on the West Coast probably contributed to the shortage. The eastern white sweet Napoleon is brined and used for the same purposes.

The northeastern growers are reported to have received an average of 2.5 cents per pound in 1934 and 1935 for cherries for cold-pack.

COLD-PACK APPLES

It was difficult to obtain definite information as to the market for cold-pack apples. All the frozen apples located were packed in 30-pound tins for the pie industry. Peeled, sliced, and frozen, ready for inclusion in the pies, they are another indication of the baker's desire to keep preparation operations out of his plant. In one city, peeled, sliced, fresh apples are sold to pie bakers.

The chief obstacle to cold-packing apples is oxidation, and packers have their secret formulas to avoid discoloration. It is understood that washing in mild salt-brine, or the addition of small amounts of acid, presumably citric acid, is the usual base of these secret methods.

One instance was found where cold-pack apples were being imported from Canada, packed by some such secret process.

Apples are cold-packed in New York, Pennsylvania, Virginia, and Michigan.

FROZEN BLUEBERRIES

All but one of the large users of frozen blueberries reported their supply as imported from Canada, New Foundland, New Brunswick, or Nova Scotia. One New York pie baker reported using 600,000 pounds packed in Maine.

MARKET

The market for frozen blueberries, as reported in the market survey, is summarized in table 18.

TABLE 18—*Location and consumption of frozen blueberries.*

Packed in 30-pound lugs—1935 market survey.

Location	No. of lugs
Chicago	13,200
Detroit	10,000
Cleveland	5,000
Pittsburgh	2,000
Boston	25,000
New York	71,000
Philadelphia	7,000
Baltimore	2,500
Washington	450
Total	136,150

Notes.—All frozen blueberries were consumed by the pie-baking industry. Above is an estimated consumption based on interviews with leading bakers, as well as reports by brokers and cold-storage warehouses. Distribution is so scattered to small consumers that an informative check through consumer interviews alone was impossible. All the berries listed were imported from Canada, Newfoundland, New Brunswick, and Nova Scotia. The 136,150 lugs equals 4,084,500 pounds. Leading importing brokers reported average annual importations of 4,700,000 pounds. The U. S. Bureau of Foreign and Domestic Commerce reported importations (Dec. 1934, to Dec., 1935) of 4,239,720 pounds.

One pie baker in New York City reported the use of 20,000 30-pound tins of Maine blueberries packed in sugar (5/1)—the only large consumption of domestic berries located.

TABLE 19—*Opening prices of northwestern frozen-pack fruits.*[1]

Prices per pound.

Kind of fruit	50-gallon barrels			50- and 30-pound tins	15-pound tins	10-pound tins
	N/S	3/1	2/1	3/1	3/1	3/1
1927						
Strawberries	.....	.....	.10½	.....	.....	.....
Cuthbert red raspberries	.....	.....	.09½	.....	.....	.....
Marlboro red raspberries	.....	.....	.....	.....	.....	.....
Loganberries	.....	.....	.07	.....	.....	.....
Cultivated blackberries	.....	.....	.07	.....	.....	.....
Currants, red, unstemmed	.....	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.....	.....	.....	.....	.....
Black raspberries	.....	.....	.....	.....	.....	.....
1928						
Strawberries	.....	.....	.09¼	.....	.....	.....
Cuthbert red raspberries	.....	.....	.11½	.....	.....	.....
Marlboro red raspberries	.....	.....	.....	.....	.....	.....
Loganberries	.....	.....	.07½	.....	.....	.....
Cultivated blackberries	.....	.....	.07	.....	.....	.....
Currants, red, unstemmed	.....	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.....	.....	.....	.....	.....
Black raspberries	.....	.....	.....	.....	.....	.....
1929						
Strawberries	.....	.....	.08¼	.....	.....	.....
Cuthbert red raspberries	.....	.....	.10½	.....	.....	.....
Marlboro red raspberries	.....	.....	.....	.....	.....	.....
Loganberries	.....	.....	.08	.....	.....	.....
Cultivated blackberries	.....	.....	.07	.....	.....	.....
Currants, red, unstemmed	.....	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.....	.....	.....	.....	.....
Black raspberries	.....	.....	.....	.....	.....	.....
1930						
Strawberries	.....	.....	.10	.....	.....	.....
Cuthbert red raspberries	.....	.....	.11	.....	.....	.....
Marlboro red raspberries	.....	.....	.....	.....	.....	.....
Loganberries	.....	.....	.09	.....	.....	.....
Cultivated blackberries	.....	.....	.06½	.....	.....	.....
Currants, red, unstemmed	.....	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.....	.....	.....	.....	.....
Black raspberries	.....	.....	.....	.....	.....	.....

[1] *Western Canner and Packer* 1936 Yearbook.

TABLE 19—(*Concluded*).

Kind of fruit	50-gallon barrels			50- and 30-pound tins	15-pound tins	10-pound tins
	N/S	3/1	2/1	3/1	3/1	3/1
1931						
Strawberries	.....	.....	.08	.....	.....	.....
Cuthbert red raspberries	.....	.....	.07	.....	.....	.....
Marlboro red raspberries	.....	.....	.....	.....	.....	.....
Loganberries	.....	.....	.07	.....	.....	.....
Cultivated blackberries	.....	.....	.05	.....	.....	.....
Currants, red, unstemmed	.....	.....	.06	.....	.....	.....
R.S.P. cherries	.....	.....	.07	.....	.....	.....
Black raspberries	.....	.....	.....	.....	.....	.....
1932						
Strawberries	.04¼	.04½	.04½	.05½	.06¼	.06½
Cuthbert red raspberries	.05	.05½	.05½	.06½	.07¼	.07½
Marlboro red raspberries	.04	.....	.....	.....	.....	.....
Loganberries	.04¼	.04¼	.04½	.05¼	.06¾	.06¼
Cultivated blackberries	.03½	.03¾	.04	.04¼	.05½	.05¾
Currants, red, unstemmed	.05	.....	.....	.06	.06	.....
R.S.P. cherries	.05	.05	.....	.06	.06¾	.07
Black raspberries	.05	.05	.05	.06	.06¾	.07
1933						
Strawberries	.08½	.08¼	.08	.09¼	.10	.10¼
Cuthbert red raspberries	.08	.07¾	.07½	.08¾	.09½	.09¾
Marlboro red raspberries	.07	.....	.....	.....	.....	.....
Loganberries	.05	.05	.....	.06	.....	.....
Cultivated blackberries	.04	.04½	.....	.05¼	.06	.06¼
Currants, red, unstemmed	.05½	.....	.....	.....	.....	.....
R.S.P. cherries	.05½	.05½	.....	.06½	.....	.....
Black raspberries	.07	.06½	.....	.07½	.08¼	.08½
1934						
Strawberries	.06½	.06½	.06½	.07½	.08	.....
Cuthbert red raspberries	.07	.06½	.06½	.07½	.08	.....
Marlboro red raspberries	.06½	.06	.....	.07	.07½	.....
Loganberries	.05	.05	.....	.05¾	.06½	.....
Cultivated blackberries	.04	.04½	.....	.05¼	.06	.....
Currants, red, unstemmed	.06	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.05½	.....	.....	.....	.....
Black raspberries	.06½	.06¼	.....	.07½	.08	.....
1935						
Strawberries	.07½	.07¼	.07	.08	.08¾	.09½
Cuthbert red raspberries	.07½	.07½	.07	.08	.08¾	.09½
Marlboro red raspberries	.06½	.06¼	.06	.07	.07¾	.08½
Loganberries	.05	.05¼	.05¼	.06	.06¾	.07½
Cultivated blackberries	.05	.05¼	.05	.06	.06¾	.07½
Currants, red, unstemmed	.06½	.....	.....	.....	.....	.....
R.S.P. cherries	.....	.05½	.05½	.06¼	.07	.07¾
Black raspberries	.08	.07¾	.07¾	.08½	.09¼	.10
Youngberries	.06½	.06½	.06½	.07¼	.08	.08¾

The importance of the Detroit market was explained as due to the concentration of highly paid industrial workmen. A leading Detroit pie baker stated that under normal employment conditions the district consumed 2,000,000 pounds of blueberries.

A few preservers reported the use of frozen blueberries for making up pie filler.

The imported berries are packed in thin wooden boxes, known as "lugs." They are packed dry, without sugar, and frozen in the lug. Berries examined after being stored for nearly a year were in excellent condition and were apparently equal to the fresh fruit in color, texture, and flavor. They were of a dark, rich-blue color, closely

graded as to size and degree of ripeness, and remarkably free from dirt and other foreign matter. The packs of a number of operators were examined in various consuming centers, and were all found to be of the highest quality.

No domestic pack of this type was located.

The Northwest packs a small quantity of wild "huckleberries." The maximum pack reported in 1933 was 116,215 pounds; in 1934, 90,000 pounds; and in 1935, 37,657 pounds.

All frozen blueberry packs reported were of wild berries. Pie bakers stated that the cultivated berry, similar to that grown in New Jersey, was not suitable for pies, as it lacked both color and flavor.

Table 20 shows an average reported delivered price per pound of 8.3 cents. This includes the price frozen and transported to eastern ports by refrigerated steamships, and inland by refrigerated cars. It also includes a 35 percent import duty the equivalent of 1¾ cents per pound. Under the new trade agreements, this has been reduced to 25 percent, or approximately 1¼ cents per pound. Transportation to New York or Boston averages ¾ cent per pound.

New York and Boston are the two main points of entry, and practically all stocks are distributed from these two points.

SELLING PRICES OF FROZEN-PACK FRUIT

The best available information on selling prices of the various frozen-pack fruits is the opening prices quoted by northwestern packers. Table 19 gives these prices for the 9 years 1927 to 1935, inclusive, covering barrel- and tin-packs and the various fruit-sugar ratios.

These opening prices are quoted before the pack starts, usually in May, and include the first month's storage. Large consumers place contracts for their estimated yearly requirements at these prices. The contract usually contains a protective clause against price reductions prior to delivery of the pack; the purchaser accepting delivery at the end of the first month's storage. These contracts give the packer a backlog of orders from which he can estimate the total pack he should put up.

Table 20 recapitulates the average delivered prices for barrel- and tin-packs of the leading cold-pack fruits as reported by users in each city covered by the market survey. This is the average of the prices paid by the large users who contract for their yearly requirements and the small users who buy in small lots as needed. Delivery costs of from 1.3 cents per pound in Chicago, to 1.5 cents in the East-Coast cities are included; also such storage charges as may have accumulated.

TABLE 20—*Average reported prices paid for cold-pack fruits, per pound delivered.*

Consumer interviews—1935 market survey.

Location	Strawberries				Red raspberries			Blackberries		Cherries			Peaches		Blueberries
	450-lb. bbls.	30-lb. tins	15-lb. tins	10-lb. tins	385-lb. bbls.	30-lb. tins	15-lb. tins	385-lb. bbls.	30-lb. tins	450-lb. bbls.	30-lb. tins	15-lb. tins	450-lb. bbls.	30-lb. tins	30-lb. lugs
Louisville	.085	———	———	———	.085	———	———	.060	———	.067	———	———	———	.090	———
St. Louis	.085	———	———	———	.090	———	———	.060	———	.061	———	———	———	———	———
Indianapolis and vicinity	.095	.135	———	———	———	———	———	———	———	———	.077	———	———	———	———
Chicago	.083	.110	———	———	.090	.118	———	.057	———	.055	.075	———	———	———	.085
Detroit	.086	.107	———	———	———	.102	———	———	———	.050	.065	———	———	.125	.082
Cleveland	.097	.110	———	———	.107	.105	———	———	———	———	.065	———	———	———	———
Cincinnati	.080	.117	———	———	———	———	———	———	———	———	.060	———	.150	.135	———
Pittsburgh	.091	.118	———	———	.102	.105	———	.062	———	———	.069	———	———	———	———
Buffalo	.095	.105	———	———	———	———	———	———	———	———	———	———	———	———	———
Rochester	.090	———	———	———	———	———	———	———	———	———	———	———	———	———	———
Syracuse	.120	.122	.132	.155	———	.127	.137	———	———	———	.077	.085	———	———	———
Utica	.150	———	———	———	———	———	———	———	———	———	———	———	———	———	———
Schenectady	.107	———	———	———	———	———	———	———	———	———	———	———	———	———	———
Albany	———	.125	———	———	———	———	———	———	———	———	.060	———	———	———	———
Boston	.094	.105	.112	———	.100	.127	———	.065	———	———	.072	———	.130	———	.083
New York[1]	.093	.102	.116	.118	.107	.115	.116	.062	.097	.054	.058	———	.092	.075	.080
Philadelphia[2]	.092	.100	———	.112	.100	.115	———	.060	———	.057	———	———	.089	———	.085
Baltimore[3]	.095	.120	.125	———	.110	.100	.105	———	———	———	———	———	.075	———	.085
Washington	.090	———	———	———	———	———	———	———	———	———	———	———	.075	.070	———
Average	.096	.113	.121	.128	.099	.113	.119	.061	.097	.057	.068	.085	.102	.099	.083

[1]New York reported youngberries in barrels, 9c; tins, 9½c; crate-frozen strawberries, capped, 7¾c.
[2]Philadelphia reported youngberries in tins, 8¼c; loganberries, 6¾c.
[3]Baltimore reported youngberries in tins, 8½c.

The overall average delivered prices for strawberries were as follows:

Barrels	9.6 cents per pound
30-pound tins	11.3 " " "
15-pound tins	12.1 " " "
10-pound tins	12.8 " " "

The high prices, 12 and 15 cents per pound, reported paid for strawberries in Syracuse and Utica, N. Y., are for small-lot purchases, reshipped from storage points.

Consumers buying strawberries graded to size reported paying premiums of from ¼ cent to ½ cent per pound over the fieldrun price; the ¼ cent applying to the Medium, or ⅝-inch to 1¼-inch grade and the ½-cent premium to the ⅝-inch to ⅞-inch grade.

The 1935 pack of northwestern strawberries opened in May at 7 cents per pound was advanced to 8.75 cents in July, to 9 cents in September, to 9.5 cents in December, and after the first of the year, to 10 cents. Other cold-pack fruits advanced in proportion. Accumulated storage charges accounted for only a small part of these increases, the main reason being an anticipated shortage. During the latter part of the market survey, frequent reports were heard of the small amount of cold-pack stocks left in the hands of the packers.

The 8,000-barrel pack in Louisiana sold in the spring of 1936 at 6 to 6.5 cents. The earlier Florida pack, however, sold at 8 cents. This is an extra-early pack coming in at a time when the ice-cream trade is putting out its first strawberry ice cream, and the price of fresh strawberries is high.

COST OF COLD-PACK OPERATIONS

In the absence of data on the cost of cold-pack operations in the Northwest, a comparison is made in table 21 of the average prices paid the growers for strawberries and the opening prices for 2/1 pack for the years 1930 to 1935, inclusive.

TABLE 21—*Comparison of average prices of strawberries and opening prices for 2/1 pack*, 1930-1935.

	1930	1931	1932	1933	1934	1935	Six-year average
	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Price per pound paid northwestern grower for capped berries (no crate expense)	8	6	2	5	4	5	5
Northwest opening prices per pound, 2/1 pack, including freezing and 1-mo. storage	10	8	4.5	8	6.5	7	7.3

As each pound of 2/1 cold-pack fruit contains two-thirds of a pound of strawberries, which at an average price of 5 cents per pound

costs 3.33 cents, and the average opening price is 7.3 cents, the average leeway for packing, freezing, sales, and profits is 3.97 cents over and above the price paid the grower for fruit.

A Tennessee packer estimated it would cost him 3.44 cents per pound over the net cost of the graded strawberries for a 2/1 pack, frozen and stored one month. This cost, which makes no allowance for overhead, sales expense, or profits, was estimated as follows:

150 pounds sugar at 5 cents per pound	$ 7.50
Capping at 1 cent per pound	3.00
Barrel	2.23
Miscellaneous labor	1.00
Freezing and storing 1 month	1.75
Total	$15.50 or

3.44 cents per pound for 450 pounds.

It is believed the capping and miscellaneous labor charges are high.

In considering these estimated costs of cold-packing operations in the Northwest, it must be remembered that the packers use their facilities for cold-packing other fruits and, in some cases, vegetables, and that many of them carry on other food-processing operations in the same plants, such as canning and drying. This tends to cut down overhead, extend labor employment, and reduce unit costs of production.

Table 22 gives a comparison of the average prices paid the growers in the Northwest for fresh fruit and the opening prices of the same fruits cold-packed. Except for the 2/1 strawberry pack, they are all packed without sugar, so that no sugar charges need be included in the packing costs.

TABLE 22—*Comparison of average prices of fresh fruits in the Northwest and opening prices of cold-packs.*

Fruit	Pack	Average price per pound paid grower	Opening price of cold-pack	Leeway over cost of fruit
		Cents	Cents	Cents
Strawberry	2/1	4	6.5	3.84
Strawberry	No Sugar	4	6.69	2.69
Red raspberry	" "	4.75	6.87	2.12
Blackberry	" "	2	4.12	2.12
Loganberry	" "	2.37	4.81	2.44
Youngberry	" "	4	6.5	2.50

FROZEN-PACK CONTAINERS

Various types and sizes of wooden barrels, tins, wooden crates and boxes, and paper and fiber cartons are used as containers for frozen-pack foods.

The 50-gallon barrel is used for the quantity packs for preservers and ice-cream manufacturers. A comparatively small number of 30-gallon barrels are packed for the larger ice-cream manufacturers

in small cities, who find the 50-gallon barrel too large and the 30-pound tin too small for their operations. The Specifications of the Northwest Fruit Barrelers Association states: "All barrels shall be new, six-hoop, paraffine-lined, and made of fir or other suitable wood."

Next in importance, from a poundage standpoint, is the 30-pound tin. In smaller numbers, the 15-pound and 10-pound tins are also used. These are round cans with slipover covers, enamel-lined for fruit, plain for vegetables. The use of the No. 10 can is increasing in the Northwest. This is approximately a 7½-pound can with friction top. A few 50-pound and 1-, 2-, and 5-gallon cans are reported in the Northwest, but their use is decreasing.

The "single-frozen" or "bulk" berry pack of the Northwest is usually packed in 32-pound solid or corrugated fiber shipping cases with a waxed-paper liner.

The imported blueberry pack uses 30-pound, thin wooden lugs or boxes.

The crate-frozen berries for the pie trade use the standard berry crate.

The Northwest reports vegetables as packed in No. 10 cans, and 5-, 8-, and 10-pound friction-top tins.

Frosted Food's (Birdseye) paper carton for the retail trade measures 5x3x2 inches and contains from 10 to 14 ounces. Their larger carton measures 10x5x2 inches and contains from 2 to 3 pounds. Birdseye containers are standardized as to size and shape for convenience in freezing and handling. The 2-inch dimension was adopted as best suited to their freezing methods.

Paraffined paper containers for packing fruits and vegetables are available in various sizes.

FREEZING AND STORAGE CHARGES ON FROZEN-PACK FRUIT

Freezing and storage rates in eastern cities covered by the market survey, are listed in table 23.

The charges for feezing and the first month's storage of 50-gallon barrels range from 60 cents in St. Louis, Cleveland, and Philadelphia, to $1.75 in Chattanooga and Nashville. New York City was next highest, with a charge of $1.26.

Holding charges per barrel, per month, for subsequent months range from 35 cents in Philadelphia to $1.00 in Chattanooga and Nashville; New York being next highest, with a rate of 81 cents.

TABLE 23—*Cold-storage rates—cold-pack fruits—corlots.*
1935 market survey.

Location	50-gallon barrels—rate per barrel				Tins—rate per 100 pounds			
	Received fresh to freeze		Received frozen		Received fresh to freeze		Received frozen	
	First month	Subsequent months	First month	Subsequent months	First month	Subsequent months	First month	Subsequent months
Pittsburgh	$0.85	$0.50	$0.70	$0.50	$0.25	$0.12½	$0.20	$0.12½
Cincinnati	.....	.....	.75	.50	.40	.15	.25	.15
Philadelphia	.60	.35	.50	.35	.....	.....	.27	.17
Rochester	1.13	.36	.65	.35	.25	.08	.20	.08
New York	1.26	.81	.60	.45	.28	.18	.23	.18
Baltimore	.....	.....	.60	.40	.....	.....	.18	.12
Buffalo	.....	.....	1.00	.50	.....	.....	.....	.....
Cleveland	.60	.35	.50	.35	.25	.15	.20	.15
Detroit	.....	.....	1.13	.50	.25	.12½	.20	.12½
Chicago	.....	.....	.50	.40	.22½	.10	.18	.10
Indianapolis	.90	.50	.....	.50	.20	.12½	.15	.12½
St. Louis	.60	.40	.55	.40	.....	.....	.....	.....
Nashville	1.75	1.00	.....	.....	.50	.20	.....	.20
Chattanooga	1.75	1.00	.....	.....	.....	.....	.....	.....
Memphis	1.00	.75	.....	.....	.....	.....	.....	.....

Many of the cold-storage companies in the cold-pack-consuming centers complained that the Northwest charged what they considered to be excessively high rates—$1.25 to $1.50 per barrel—for freezing and storing for the first month, and too low a holding rate—30 cents per barrel per month—thereafter. As a result, the pack is held in the Northwest as long as possible and the eastern storage warehouse is limited often to less than a month's holding of 1-car lots for day-to-day withdrawals—a troublesome and unprofitable business. They claimed that a longer storage period would enable them to reduce their charges and operate at a profit instead of a loss. They were interested in the possibility of Tennessee's starting a cold-pack industry which would compete with the Northwest and give them longer storage periods.

It is only fair to the northwestern storage concerns to call attention to the present practice in the Northwest of turning and rocking the barrels during the freezing period and the first month's storage, which adds appreciably to labor costs and may not have been taken into account by the eastern concerns.

TRANSPORTATION

The Northwest transports at least 80 percent of its frozen-pack shipments to the East and Midwest by railroad refrigerator cars, and the remaining 20 percent by refrigerated steamers to eastern ports.

The freight rate by rail to Chicago and eastern points is $1.05 per 100 pounds, with a refrigeration charge varying from $75.00 to $95.00 per car. An additional charge for salting increases the total refrigeration charge to an average of about $100.00 per car. For barrel shipments, from 8 to 12 percent of salt is added, and for smaller containers, 13 to 16 percent. The extra salting fee is 20 percent of the refrigeration cost for barrels and 30 percent for the smaller containers. The carload minimum weight from the West Coast is 46,000 pounds. The total transportation cost per pound averages from 1.3 cents on Chicago consignments to 1.5 cents on shipments to the East-Coast cities.

The rate by boat is 90 cents per 100 pounds, with no additional refrigeration charge. Seattle is the only port, however, which has this service regularly to the East, and the capacity is limited at present to about 100 tons every two weeks.

A comparison of the freight rates and refrigeration charges on frozen fruits from Seattle, Washington, and from Chattanooga, Nashville, and Dyersburg, Tennessee, to the leading consuming centers, is covered by table 24, prepared by the Tennessee Valley Authority. The transmitting letter contains the following statements:

TABLE 24—*Freight rates.*

To	From							
	Seattle[1]		Chattanooga[2]		Nashville[2]		Dyersburg[3]	
	Rate per 100 lbs.	Refrigeration charges per car	Rate per 100 lbs.	Refrigeration charges per car	Rate per 100 lbs.	Refrigeration charges per car	Rate per 100 lbs.	Refrigeration charges per car
	Cents		Cents		Cents		Cents	
Chicago	105	$ 90.00	94	$60.00	76	$57.50	38½	$57.50
Cleveland	105	100.00	93	60.00	84	65.00	57	65.00
Detroit	105	100.00	95	65.00	86	70.00	55½	70.00
Boston	105	110.00	117	80.00	126	80.00	81½	80.00
New York	105	105.00	108	72.50	117	72.50	78	72.50
Philadelphia	105	105.00	103	72.50	112	72.50	74	72.50
Baltimore	105	105.00	99	72.50	108	72.50	72	72.50
Terre Haute	105	95.00	82	60.00	64	57.50	-------	------

[1]Berries or fruit, in water or in their own juice, or sugared, when chilled or frozen for preservation in transit, in metal cans, crated, or in bulk in barrels, or in triple-walled waterproof inner containers packed in fiber boxes complying with Rule 41 of current Western Classification, C. L. minimum weight, 46,000 pounds.

[2]C. L. Minimum weight, 30,000 pounds.

[3]Strawberries (frozen or not frozen), sugared for preservation, in bulk in barrels, carloads, minimum weight, 36,000 pounds.

Tariff authorities. H. G. Toll, 3-11, 1CC 1356; R. A. Travillion, 148-0, ICC 8042; R. A. Sperry, 15-B, ICC 304; B. T. Jones, 450-C, ICC 2849; R. C. Dearborn, 8, ICC 7.

"There is, at the present time, no uniform basis of freight rates on cold-pack berries from prospective Tennessee producing points to the area north of the Ohio and Potomac Rivers. This is not an unusual situation where a new commodity is being placed upon the market. Freight rates must necessarily be readjusted from time to time to meet changing commercial conditions. The absence of an entirely satisfactory system of rates on berries prepared by the cold-pack process should not prove a stumbling block to the development of this new industry. Rates can be revised to accommodate this commodity when the necessity actually arises. As a matter of fact, some revisions have already been made in the rates applicable from Tennessee origins. This may be noted by reference to the attached statement contrasting the rates from representative points in Tennessee to selected destinations in the North with the rates applicable from Seattle, Washington, to the same points."

Silica-Gel cars, which operate on the absorption refrigeration principle, are coming into increased use. They are approved by the cold-pack consumers because of the close temperature regulation. The cost is somewhat lower than the usual refrigeration charges. The operators of the Silica-Gel cars guarantee cross-continental shipments at any time of year with a temperature variation of not more than 2 degrees plus or minus. Reports have been received of northwestern shipments in these cars arriving at zero temperature, while under the same conditions, ice-refrigeration cars arrived at 18 to 20 degrees.

Refrigerator trucks are used for short hauls or smaller quantities, and are reported satisfactory.

Suitable containers are available for using dry ice as a refrigerant for small-lot shipments.

MODERN METHODS OF COLD-PACKING STRAWBERRIES

The only standard specifications for cold-pack fruits are those adopted by the Northwest Fruit Barrelers Association (see Appendix), and U. S. Standards for Washed and Sorted Strawberries for Freezing, issued by the Bureau of Agricultural Economics, U. S. Department of Agriculture, effective June 1, 1935. It will be noted that the latter apply to the fruit before it is frozen.

The U. S. Standards define the two grades of pack as follows:

"U. S. No. 1 shall consist of strawberries of one variety which are properly washed, well colored, free from mold and decay, and from soft, badly crushed or split, dried or undeveloped berries and from damage caused by foreign matter, hail, sunscald, birds, disease, insects, mechanical or other means. Caps shall be entirely removed. Unless otherwise specified, the minimum size shall be not less than ⅝ inch in diameter.

"In order to allow for variations incident to proper grading and handling, not more than 5 percent, by weight, of the strawberries in any lot may be below the requirements of this grade, provided that less than 1 percent shall be affected by mold or decay.

"Unclassified shall consist of strawberries which do not meet the requirements of the foregoing grade."

The National Preservers Association, in Washington, D. C., stated that they had not made up a standard specification for cold-pack fruits, but that they had adopted and approved the standards of the NFBA.

It is understood that all of the northwestern Marshall cold-pack adheres to the NFBA standards, and that each barrel carries a Federal and state inspection certificate which assures the buyer that the U. S. standards have been met. This certificate was accepted by the large users of northwestern cold-pack as proof that they were getting clean, first-quality fruit, packed according to specifications.

Arrangements have been made by the Division of Markets, Tennessee Department of Agriculture, to make this service available to Tennessee packers.

A summary of the essentials of a high-quality pack, based on interviews with consumers, follows:

1. Berries must be of a variety suitable for freezing and for utilization for the various purposes for which cold-pack is used, such as preserves, ice cream, pies, and retail.

2. Berries should be allowed to ripen in the fields beyond the point where they are usually picked for the fresh market.

3. Berries should be packed for freezing in sanitary surroundings, as near the fields as practicable, to shorten the elapsed time between picking and packing so as to avoid spoilage, contamination by dust, mold, bacteria, or loss from other causes.

4. Berries must be thoroughly washed, graded as to size, and sorted for foreign matter and spoiled and imperfect fruit.

5. Berries should be thoroughly mixed with sugar and coated with sugar as they are put into the containers. The sugar should be completely melted before the containers are placed in the freezing room.

6. The period between packing and freezing should not be unnecessarily long. Indications are that the shorter the period, the better the color, flavor, and texture of the berries.

7. Freezing at zero for from 48 to 72 hours and holding in storage at 12° to 15° above zero, seems to result in a pack which best meets trade preferences.

U. S. Department of Agriculture Technical Bulletin 148, dated January, 1930, gives a comprehensive report of the experimental work carried on in the Northwest by H. C. Diehl, J. R. Magness, C. R. Gross, and V. B. Bonney, of the Department, in cooperation with northwestern growers, packers, and the Washington State Experiment Station.

The best description of later and improved methods, adopted since the publication of bulletin 148, is found in a paper on "History and Method of Cold-Packing Strawberries," presented by Mr. R. T. Shannon of the Bodle Co., Seattle, Washington, at the 1934 Convention of the International Association of Ice Cream Manufacturers. In an article in *Food Industries*, February, 1935, Mr. Shannon substantially repeated the descriptions. It can therefore be assumed that these methods were followed by the Bodle Company, which is one of the leading northwestern packers, as late as the 1935 pack.

Descriptions and comments on the northwestern pack by eastern purchasers, who had inspected operations in the Northwest, were in substantial agreement with Mr. Shannon's descriptions. Some additional points were brought up as to grades and individual requirements of the different users.

Mr. Shannon states that the berries are capped in the field and delivered to the packing plant in flat crates of 12 wood veneer hallocks, holding approximately one pound each. At the packing plant they are inspected by a Federal inspector, who passes or rejects each lot as it is delivered by the grower.

One of the best eastern packers caps the berries in his packing plant; and it is believed that this is general eastern practice. The usual shipping crates and baskets are used for delivery to the plant, and there is no Federal inspection so far as could be learned.

WASHING

The berries are first washed in a tank of circulating water, and then sprayed with clean water as they are carried out of the tanks on wire-mesh belts to the size grader.

SIZE GRADING

Mr. Shannon describes a hole grader which is a shaker table made of copper plates with ⅝-inch perforations; or a slat grader made of thin wood or metal strips spaced ⅝ inch apart. This drops out the ⅝-inch berries, which are thrown away. The remaining fruit may be sold as "Fieldrun" or run through another grader to remove fruit larger than 1¼ inches, leaving the "Medium Graded" berries. All berries over 1¼ inches are designated as "Special Large Graded."

Interviews with preserve manufacturers indicated a general demand for more closely graded fruit—⅝ to ⅞ inch—and they can now obtain this grade. One reason for preferring the smaller fruit is that a more uniform-sized berry makes a better appearance in a jar of preserves. Another reason is the growing practice of hotels and restaurants of serving a small-sized paper cup of preserves, especially with breakfast. One large berry in a cup obviously would not do, while two small berries would be acceptable.

SORTING

After being graded as to size, Mr. Shannon states that the berries drop onto a wide white rubber sorting belt. This inspection belt runs under a strong white light and uniformed women stand on each side and sort out all foreign matter and imperfect or decayed berries. They are instructed to remove all fruit they would not serve on their own tables. NFBA specifications, paragraph 5, and the U. S. Standards for U. S. No. 1, give definite instructions for sorting and the tolerances permitted. NFBA is even more rigid than the "U. S. Standards."

PACKING

The sugar and fruit are run into the barrels so as thoroughly to coat the individual berries with sugar and insure accurate proportions. Mr. Shannon says an attendant regulates the amount of sugar going into the barrel according to the volume of fruit so that each berry falls through a spray of sugar. It is understood that this is sometimes done automatically. The barrel is set on agitated rockers during the filling to settle the fruit.

INSPECTION

Mr. Shannon does not mention further inspection, but "U. S. Standards" states: "These standards are intended for use only for strawberries which have been washed and sorted just prior to being placed in containers for freezing," indicating an inspection at this time on which the State and Federal certificate is based.

FREEZING

After being weighed and coopered, the barrels are rolled out on the floor, left on their sides, and given a half-turn and rocked frequently to insure complete melting of the sugar and mixing with the fruit, so that the berries shall be "sugar-cured" before being placed in the freezing room. Too long a time should not elapse, however, before freezing; and therefore the freezing facilities should not be too far distant from the packing plant.

The berries are frozen at zero, the time required being from 48 to 72 hours, and the barrels should be given a half turn at least four times each day.

STORAGE

A temperature of 12° to 15° F. is maintained in the holding rooms, and the barrels should be turned several times during the first month in storage.

SANITATION

The health authorities of many cities are showing increasing interest in the conditions under which frozen foods are packed, especially products which are not cooked before using, such as frozen fruits for ice cream.

SLICED BERRIES

Sliced berries are packed mainly for the ice-cream trade, although one large packer for retail is also offering sliced berries as retaining more nearly the flavor of fresh fruit.

The packers claim an improved product. Mr. Shannon mentions a tendency to firm but not toughen the fruit, noting that "each slice remains whole and firm, with a striking uniformity of color . . . even though there was some variation in the color of the berries from which the slices were cut." He observes "an unusual lack of iciness and a remarkably true fresh fruit flavor," also "the lack of oxidation on the tops of the barrels, which is more or less evident in the pack of whole berries."

These advantages are attributed to the prompt penetration of the sirup solution formed of the sugar and berry juice; and the absence of oxidation, to the thorough mixing of the fruit and sugar.

M. J. Mack and C. R. Fellers, of Massachusetts State College, presented a paper on "The Use of Frozen Sliced Strawberries in Ice Cream," at the 1934 Convention of the International Association of Ice-Cream Manufacturers, and summarized the subject as follows:

"We feel that the question of slicing strawberries is a problem of first consideration only to the fruit packer; to the ice-cream manufacturer it is of secondary consideration. The fruit packer evidently can improve the quality of his frozen strawberries by slicing them previous to cooking. The practice improves the flavor and appearance of the product somewhat, helps to get all the sugar in solution, produces a product which appears to contain less syrup, gives the fruit a slightly firmer texture, and decreases to some extent deteriora-

tion of the fruit at the surface of the container. To the fruit packer, slicing strawberries appears to be another means of improving his product.

"The ice-cream manufacturer should look with favor upon the innovation of sliced strawberries. However, he should not blindly insist that sliced berries be purchased. He should bear in mind that such factors as variety of fruit, size, and quality of the berries, degree of ripeness, and fruit to sugar ratio, are factors which have a greater effect on the flavor of the ice cream than does slicing the fruit before packing. The purchaser of fruit has no assurance that the packer is using the same grade of berries for slicing as for his whole fruit packs. Therefore, the ice-cream maker must buy the strawberries that impart the best flavor to his ice cream. He should not forget, however, that other factors being the same, slicing berries before packing does improve somewhat the quality of the frozen fruit."

Interviews with ice-cream manufacturers indicated that the sliced berry was of most interest to those using continuous freezers and running the entire mix through the freezer, as the smaller particles pass more easily through the circulating pump and lines to the freezer. However, the rapidly increasing use of the fruit injector, which injects the fruit into the mix as it leaves the freezer, has lessened interest in the sliced berry, which costs them ½ to ¾ cent per pound more than the regular "fieldrun." Few of the manufacturers would say that the sliced berry produces a better ice cream.

In the Investigator's opinion, the best cold-pack strawberries, in flavor and color, inspected on the entire market survey, were packed by an eastern ice-cream manufacturer, who bought strawberries, probably Missionaries, in the local market, capped and washed them, and made up a 2/1 mix in a wooden tub. He mixed them thoroughly with a long wooden paddle without any special regard to whether he broke the berries or not, but with the object of quickly and thoroughly melting and mixing the sugar with the berries. When the sugar was melted, the berries were packed in barrels and immediately placed in the freezing room. There was no oxidation on top of the barrel, the color was bright, and they looked and tasted like fresh berries.

Three reasons occur to the writer as possibly accounting for the excellent quality: (1) the sugar was melted quickly; (2) the sugar was thoroughly distributed; and (3) the fruit was frozen quickly after packing.

CRATE-FROZEN STRAWBERRIES

Crate-frozen strawberries constitute a purely eastern development, and are used almost exclusively for pies. A few packers have made a practice of buying distress stock at low prices in the straw-

berry-growing centers and having the crated berries frozen in nearby cold-storage plants or shipped north for freezing. Probably the bulk of the pack consists of surplus fresh stock bought up by pie bakers in their local fresh markets at the end of the day, or week, and put into local cold-storage warehouses for freezing and holding.

Generally the berries are frozen just as they are packed for the fresh market, without capping or sorting. Pie bakers explained that they could use these berries satisfactorily if the berries were kept frozen until mixed in the pie fill or placed in the oven. This necessitated capping and cleaning while the berries were still frozen. One large pie baker, using approximately 600,000 pounds per year, buys crate-frozen berries which have been capped and cleaned before they are frozen.

The pie bakers claimed as good a product as when using berries fresh from the market. An official of one large eastern pie company preferred the crate-frozen to the regular sugar cold-pack, stating that the sugar pack contained too much moisture for use in pie baking, while in the crate-frozen, part of the natural moisture of the berry had been lost during the freezing and holding.

The crate freeze is used to a limited extent for other cultivated berries for the pie trade.

SINGLE-FROZEN BERRIES

The *Western Canner and Packer* 1936 Yearbook reports a new northwestern pack which is designated as "single-frozen" or "bulk" pack. It reports that about five years ago a major frozen packer and a western pie baker conducted experiments on individually frozen berries, which they found "worked up splendidly in bakery goods." This pack has gained from year to year until in 1935 the following pack was made:

Strawberries	24,000	pounds
Red raspberries	44,352	"
Blackberries	305,875	"
Loganberries	472,373	"
Black raspberries	6,600	"
Gooseberries	800	"
Huckleberries	13,077	"
Dewberries, youngberries, etc.	9,220	"
Total	876,297	"

The total 1934 bulk pack was 226,761 pounds.

"The berries were 'single-frozen' on belts and trays and other devices, and this type of package seems here to stay . . . . They were packed mainly in 32-pound solid and corrugated fibre shipping cases with a waxed paper liner. Some use an ordinary light canner's case, but most of the packers prefer something a little heavier, or with a fibre liner to add rigidity."

This pack must be recognized as a coming competitor of the crate-frozen pack of the East and the 4,500,000 pounds of imported Canadian blueberries, frozen without sugar in wooden lugs, for the pie trade.

SIRUP PACK

The present commercial cold-packs are of two general types: (1) fruit frozen without sugar, and (2) fruit frozen with various proportions of dry sugar. One packer of Montmorency cherries reported packing part of his fruit in invert-sugar sirup.

Many research workers in the cold-pack field are convinced that the packing of fruits in a sugar sirup has distinct advantages. They claim that the texture, color, and flavor of the product more nearly approach those of the fresh fruit, and that any discoloration due to oxidation is avoided. This method, however, has the disadvantage of adding moisture, and added moisture is objectionable to all purchasers of cold-pack fruit for processing.

The preservers pointed out that in order to evaporate the added moisture, longer cooking would be required, entailing a further darkening and breaking up of the fruit over that encountered with the present pack.

The ice-cream manufacturers stated that the sirup pack would make it necessary to reduce the moisture content of other components of the mix to compensate for the additional water, and this would be difficult, as they had little opportunity in their operations to evaporate moisture, and it would mean changing their entire production arrangements.

The pie bakers also objected that any additional moisture over that contained in the natural fruit would require longer baking time for its evaporation, which would be detrimental to their product.

All three industries protested paying cold-pack prices and high transportation rates on water. The preservers pointed out that the additional water content would reduce their yield of preserves per barrel of cold-pack, and so materially increase the unit cost of their product.

They all seemed to agree that the modern northwestern cold-pack methods had overcome the early objectionable features of the sugar pack to the point where the sirup pack would have no practical advantages from the standpoint of quality.

DISTRIBUTION CHANNELS

Figure 7 diagrams the channels followed by the northwestern and eastern packers and the Frosted Foods Sales Corporation.

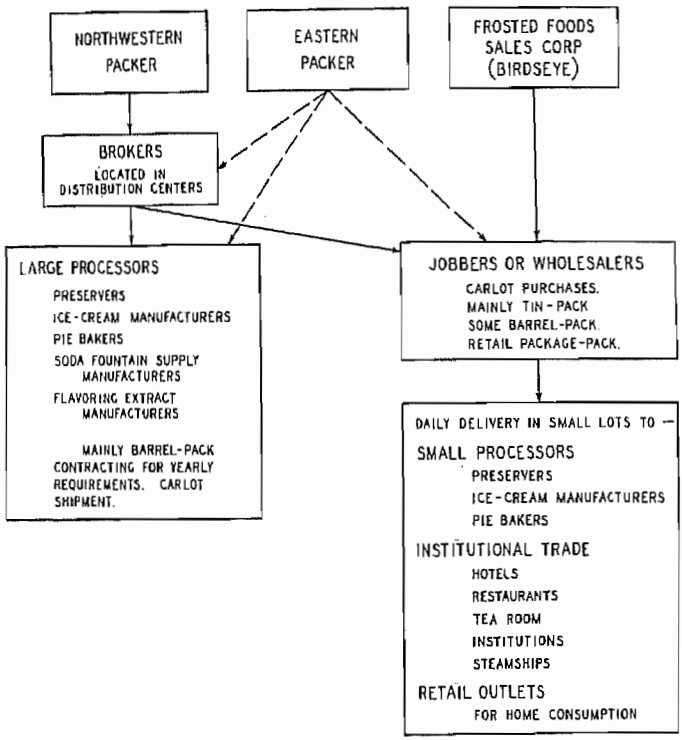

Figure 7—Cold-pack distribution chart.

The northwestern packers follow a consistent and effective method of distribution. They have established connections with leading food brokers in the important centers of frozen-pack consumption, and these brokers are, in effect, the packers' sales representatives. The brokers work on a commission of 4 to 5 percent on all sales, bearing their own sales expense. This arrangement gives the packer all the advantages of his own district sales offices in the important buying centers at a predetermined percentage cost, which is not payable until the sale has been made and payment received.

The jobbers and wholesalers reported a write-up of from 15 to 30 percent, the average being approximately 25 percent. The packer sells outright to jobbers and wholesalers whose credit standings have been established, and is relieved of all risk as to the credit rating of the small buyer.

Frosted Foods sell directly to jobber and wholesaler through their own district offices. Specializing on the small-container types of

pack for the retail and institutional trade, they rarely sell to processors.

As indicated by Fig. 7, the eastern packers seldom follow established distribution channels, but sell through any or all channels. This practice encourages large consumers to attempt to buy direct from the packers at less than prevailing prices. The adherence of all packers in a district to regular methods of distribution would go a long way toward preventing cut-throat competition.

Eastern conditions differ from those in the Northwest, due to the large fresh market and the proximity of the users to the strawberry fields. In some cases large consumers do their own packing, either packing near the producing fields or buying surplus stocks of fresh fruits in their local markets. A few of these packer-consumers job or wholesale their excess, and cold-packing has become an important side line to their regular business. Many processors reported that they did their own packing, as they liked the eastern berry but could find no reliable source of supply; and some of them intimated they would stop packing if a good eastern pack were available.

Many pie bakers buy surplus berries in the fresh-fruit market and place the crates in cold-storage warehouses for freezing; and many of the smaller ice-cream manufacturers pack, freeze, and store in their own plants.

There is also a type of eastern packer who makes no plant investment and packs when and where cheap surplus fruit is available and profits are easy and ample. In years when berry prices are higher he does not operate. The grower cannot depend on him as an outlet for his fruit, or the broker or wholesaler or consumer as a source of supply.

FROZEN-PACK FRUITS IN THE PRESERVE INDUSTRY

The importance of the preserve industry in the frozen-pack fruit market is indicated by table 25, covering the total barrel-packs of strawberries, red raspberries, and blackberries as located by the market survey, and the amounts processed into preserves.

TABLE 25—*Barrel-packs of strawberries, red raspberries, and blackberries located by the market survey, and amounts processed into preserves.*

Kind of fruit	Total No. of barrels	No. of barrels used in preserves	Percentage used in preserves
Strawberries	72,693	63,620	87.5
Red raspberries	22,601	22,465	99.0
Blackberries	6,501	6,501	100.0
Total	101,795	[1]92,586	90.0

[1]Strawberries, 68.5%; red raspberries, 24.5%; blackberries, 7.0%.

LOCATION OF PRESERVE INDUSTRY

The important preserving plants are located near or in the large population centers. The West Coast manufacturers preserves mainly

for its own use, shipping out only about 20 percent of its total production. With the exception of one plant in Minneapolis, the important preserving plants are located either on or east of the Mississippi River.

Their location and relative importance as providing a market for cold-pack fruits are indicated by table 9 and Fig. 5, covering total amounts of cold-pack strawberries reported by preservers in the consuming centers; by table 11, covering red raspberries, and table 13, covering blackberries.

PRESERVE VARIETIES

The only information obtainable covering the production of preserves by varieties is the 1930 survey of the industry made by the Foodstuffs Division of the Bureau of Foreign and Domestic Commerce, at the request of the National Preservers Association.

This survey indicates that preserves and jams constitute approximately 50 percent of the entire production of the preserve industry; jellies, 27 percent; fruit butters, 20 percent; and citrus marmalade, 2.5 percent. Approximately 75 percent of all products are packed in glass, 13 percent in tin, and 12 percent in other containers.

The relative positions of the four leading fruits using cold-pack, in the total production of preserves and jellies, are as follows:

	Preserves	Jellies
Strawberries	37.81 percent	4.5 percent
Raspberries	17.76 "	13.0 "
Peaches	8.55 "	..... "
Blackberries	6.27 "	2.9 "

The 1935 market survey data check approximately with the above proportionate use of strawberries, raspberries, and blackberries, but not of peaches. Little use of cold-pack peaches was reported, the discoloration of the peach, due to oxidation, either before or during processing, being given as a reason. Several preservers reported using fresh or canned peaches, but in general peach preserves did not appear to be considered an important item.

The preservers interviewed in 1935 reported the demand for strawberry jelly as very light.

PRESERVE STANDARDS

The National Preservers Association at the time the NRA codes were formed, agreed on standards for their industry covering preserves, jams, jellies, and similar products. The leaders of the industry are still trying to adhere to these standards, and so far as possible the Food and Drug Administration is enforcing them. The most important requirement is that not less than 45 pounds of fruit shall be used to each 55 pounds of sugar. Many manufacturers com-

plained that a number of preservers did not live up to this requirement and were selling their product at a price which it was impossible to meet with a standard preserve. A number of prominent companies reported that they had discontinued the manufacture of preserves due to this competition and were taking up other food lines.

PRESERVE COSTS

The Code Authority for the Preserving Industry prepared an average cost sheet covering the cost of strawberry preserves made from 2/1 cold-pack strawberries. They calculated that each pound of 2/1 strawberry pack yielded approximately 1.23 pounds of preserves. On the basis that the cold-pack fruit cost 7¾ cents per pound delivered, they showed the average cost of standard strawberry preserves packed in 1-pound glass jars to be approximately 15½ cents each. During the fall of 1935 the cost of 2/1-pack strawberries delivered in New York and other preserving centers, without local storage charges, was from 9 to 9½ cents per pound. At the same time so-called strawberry preserves were being offered at retail at 13½ cents to 15 cents per pound.

An interesting side light on the competition encountered by fruit preserves and jellies as sweet "spreads" is contained in Cornell University Extension Bulletin 221, reporting a survey made in the interests of the honey industry. It was found that preserves, jams, and jellies accounted for 60 percent of all food used as substitutes for honey, and concluded—

"It thus appears that honey sales are likely to depend to a considerable extent on the quality and price of the jams, jellies, preserves, marmalades and syrups offered for sale at the same time."

FROZEN-PACK FRUITS IN THE ICE-CREAM INDUSTRY

The ice-cream industry is the second largest user of barrel-pack frozen fruits, accounting for approximately 12 percent of the total barrel-pack of strawberries located by the market survey (table 4), all of the peaches (table 15), and a small part of the red raspberries (table 11).

The proportionate use of cold-pack strawberries by the ice-cream industry in the northeastern cities is indicated by table 10 and Fig. 6. This is approximately correct, with the exception of New York City. Although fruit flavors are not reported as especially popular, New York should undoubtedly show a higher consumption than Philadelphia and Boston.

This inconsistency is due to the method of giving information by some of the large ice-cream chain systems which have their headquarters in New York. The local plants being so close to headquarters, in

TABLE 26—*Ice-cream sales—flavor analysis.*[1]

Flavor	Districts of the United States						Canada
	North Atlantic	Central Eastern	Southern	Middle Western	Western	All districts	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Vanilla	39.35	60.18	50.29	67.39	57.96	48.46	64.98
Chocolate	21.26	8.89	12.14	11.18	12.31	16.78	4.89
Strawberry	8.72	8.08	10.50	5.05	9.79	8.27	11.55
Peach	3.50	.55	2.47	.39	.24	2.27	.....
Cherry	2.63	1.06	2.71	1.52	.15	1.98	2.80
Maple	1.34	1.47	.93	2.45	2.55	1.62	11.15
Burnt almond	1.95	.....	.87	.11	.22	1.18	.....
Pineapple	1.94	1.17	2.05	.56	.33	1.50	1.31
Black walnut	.50	.12	2.05	.54	.34	.50	.....
Caramel	.51	.18	.38	.50	.17	.41	.....
Butterscotch	.21	.47	.21	.31	.10	.26	.69
Banana	.12	.13	.98	.49	.37	.24	.....
Coffee	.33	.02	.02	.02	.07	.20	.18
Raspberry	.22	.14	.06	.07	.12	.17	.....
Tutti-frutti	.....	.37	.18	.75	.17	.17	.....
Fruit salad	.04	.18	.05	.22	.60	.15	.36
Lemon	.06	.07	.86	.21	.29	.14	.....
Pistachio	.05	.....	.16	.....	.28	.07	.....
Nesselrode	.02	.....	.05	.03	.....	.02	.....
Miscellaneous[2]	17.07	16.92	13.04	8.21	13.94	15.61	2.09
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1]International Association of Ice Cream Manufacturers, 22nd General Survey, Special Bulletin No. 42, March, 1933.

[2]Includes sherbets, water ices, frozen suckers, etc., when reported separately.

some instances referred inquiries to the main office, and the officials, while willing to discuss their operations as a whole, were reluctant to disclose individual plant consumptions. Since their totals included plants in other cities, most of which had been covered, it seemed best to omit their figures entirely, which materially reduced New York City's total.

A flavor analysis of ice-cream sales (table 26) places strawberry first of the fruit flavors, and third of all flavors in all sections of the United States; vanilla and chocolate holding first and second places, respectively. Strawberry's popularity is highest in the Southern and Western States and lowest in the Midwestern. Strawberry ice cream averages slightly over 8.25 percent of the total ice-cream sales.

In a few localities the market survey found strawberry being challenged for third place by other flavors. A small isolated section of New England reported coffee flavor as rivaling strawberry for third place; Boston reported the growing popularity of maple-nut; while in Philadelphia, Baltimore, and Washington, buttered pecan was having a popular run.

Peach ice cream is only 2.27 percent of the total production. It is most popular in the North Atlantic and Southern States and least popular in the Midwestern and Western.

The distribution of the 1933 ice-cream production by sections of the country (table 27) was approximately as follows:

North Atlantic	42	percent
Central Eastern	24	"
Southern	18	"
Midwestern	10.5	"
Western	10.5	"

Of the total U. S. production, 65 percent is produced by plants having a yearly capacity of 100,000 gallons or over. Plants of this capacity produce the following proportions of the total production in each section:

North Atlantic	83	percent
Central Eastern	61	"
Southern	89	"
Midwestern	47	"
Western	45	"

An analysis of table 27, together with Fig. 6 and tables 4 and 5, will indicate the market for cold-pack strawberries in the ice-cream industry, as to location and volume, and the size of plants which are doing the major part of the buying in each district.

The market survey found a tendency in the Midwest to use fruit flavors over a longer period than in the Northeast. This indicates the possibility of educating the public to demand fruit flavors out of season, and so increase the consumption of cold-pack fruits in the ice-cream industry.

TABLE 27—*Ice-cream plants in the United States, grouped according to size, and showing 1933 ice-cream production. May and August used as sample months.*

Number of plants	Plant classification	Gallons produced
	United States	
1853	Under 10,000 gallons	6,726,896
717	10,000 to 25,000 gallons	11,733,856
426	25,000 to 50,000 "	15,327,260
271	50,000 to 100,000 "	18,736,863
202	100,000 to 250,000 "	30,870,775
96	250,000 and over	65,517,350
3565		148,913,000
	North Atlantic	
370	Under 10,000 gallons	1,289,773
111	10,000 to 25,000 gallons	1,836,138
82	25,000 to 50,000 "	3,076,946
64	50,000 to 100,000 "	4,333,101
61	100,000 to 250,000 "	9,183,785
53	250,000 and over	42,728,257
741		62,448,000
	Central Eastern	
436	Under 10,000 gallons	1,652,947
183	10,000 to 25,000 gallons	3,005,125
118	25,000 to 50,000 "	4,208,099
72	50,000 to 100,000 "	5,011,578
55	100,000 to 250,000 "	8,474,656
21	250,000 and over	13,833,595
885		36,186,000
	Middle Western	
290	Under 10,000 gallons	1,068,268
130	10,000 to 25,000 gallons	2,082,081
70	25,000 to 50,000 "	2,498,877
35	50,000 to 100,000 "	2,436,155
23	100,000 to 250,000 "	3,589,611
10	250,000 and over	3,825,008
558		15,500,000
	Southern	
228	Under 10,000 gallons	977,452
144	10,000 to 25,000 gallons	2,413,938
98	25,000 to 50,000 "	3,534,738
65	50,000 to 100,000 "	4,524,141
40	100,000 to 250,000 "	5,487,829
7	250,000 and over	2,133,902
582		19,072,000
	Western	
529	Under 10,000 gallons	1,738,456
149	10,000 to 25,000 gallons	2,396,574
58	25,000 to 50,000 "	2,008,600
35	50,000 to 100,000 "	2,431,888
23	100,000 to 250,000 "	4,134,894
5	250,000 and over	2,996,588
799		15,707,000

[1]From a study of 3,561 ice-cream plants. Prepared by the Statistical and Accounting Bureau of the International Association of Ice Cream Manufacturers, from statistics of the Bureau of Agricultural Economics, United States Department of Agriculture, for the year 1933.

FROZEN-PACK FRUITS IN THE PIE INDUSTRY

While the pie industry is a poor third in the use of the barrel-pack of frozen strawberries, accounting for only a fraction of 1 percent, it takes approximately 60 percent of the tin-pack and all of the crate-frozen berries. Another 20 percent of the tin-pack, going to the institutional trade, is used mainly for making pies. Some additional barrel-pack is used indirectly in the form of pie filler manufactured by preservers. The more than 1,000,000 pounds of barrel- and tin-pack (tables 4 and 5) reported during the market survey, together with the estimated 3,600,000 pounds of crate-frozen berries (table 7) indicates a probable market for 5,000,000 pounds of frozen strawberries for pies.

Pies have not been as thoroughly commercialized as preserves and ice cream, probably because they must be disposed of while fresh and are easily injured in packing and handling for delivery. A complete survey of the industry is correspondingly difficult. In some large cities there are bakeries producing pies exclusively, and even chain pie bakeries, but more often pies are a side line in bread or cake plants. In other cities, notably, and surprisingly, Boston, there are no large commercial pie bakers.

Commercial pies are distributed to retail customers and to the institutional trade, especially to small lunch rooms and soda fountains with restricted kitchen space, which do not prepare any food which can be purchased ready to serve. The better class of hotels and restaurants, as well as the tea-room type of eating place run by women, usually make their own pies. All of these pies, commercial or home-made, are prospects for cold-pack fruits.

Cold-pack fruits appeal to pie bakers of all classes, not only as offering fresh fruit for pies, both in and out of season, but as a standardized high-quality product prepared ready for use. This latter factor is becoming increasingly important, eliminating from factories and kitchens the space-taking and time-consuming operations not required for other types of pies or other regular operations.

The most popular cold-pack fruit in the pie trade is the northern Montmorency cherry, packed mainly in New York, Michigan, and Wisconsin. It was estimated that the pie industry consumed 85 to 90 percent of the 16,000,000-pound 1935 pack.

The pie industry uses practically all of the imported and domestic blueberry pack.

The apple is undoubtedly the most popular pie fruit and the only fruit used consistently over the entire year in the territory covered by the survey. Frozen apple slices packed in 30-pound tins are increasing in use.

The Midwest consumes more fruit pies during the out-of-season months than the Northeast, which uses little fruit except apples during the winter months. This is explained as being due to the high cost of the fresh fruit compared with other types of pie filler, the lack of demand for fruit pies, and the unwillingness of the individual consumer to pay more for a fresh-fruit pie than for other kinds. How much of this consumer preference is due to dislike of the typical canned-fruit commercial pie and the belief that only canned or dried fruits are available, is not known. The fact that apple pies are popular the year round indicates that it is not due to an inherent indifference to fresh-fruit pies during the winter months.

It will be noted that 30 pounds seems to be the favorite unit in the pie industry—30-pound tins, 30-pound wooden lugs, and the 36-pound crates which net approximately 30 pounds of capped and sorted fruit.

FROZEN FRUITS AND VEGETABLES FOR INSTITUTIONAL AND RETAIL DISTRIBUTION

Throughout the Midwest the market survey received extremely pessimistic accounts of attempts to build up the retail distribution of frozen-food products. The retailer complained of the high cost of the storage cabinets and their high maintenance costs; and that the housewives were not interested in frozen foods, associated them with the old cold-storage foods, poultry, eggs, etc., and would not care for them properly in the home, sometimes allowing them to thaw and spoil before using.

Nowhere throughout this section was there any evidence of consistent attempts to inform housewives regarding frozen foods as to comparative costs, proper handling and cooking, or nutritive value and identity with fresh foods rather than with canned or the old-fashioned cold-storage product.

The retail grocer who had put in an expensive storage case found its cost and maintenance amounted to a burdensome charge against his profits, and if he had fresh fruit and vegetable and meat departments, he was merely competing with these departments. He could not be expected to push a line which added materially to his expense and merely shifted sales from his original departments. Retailers rarely take on lines of this character until the aggressive advertising of the manufacturer arouses a demand which forces them to carry the product.

In the fall of 1934, new sales promotion and distribution methods were tried out in Syracuse, N. Y., and later in Rochester. The chief changes were: a less expensive mechanically refrigerated storage case was offered the retailer on a rental or rental-purchase basis, an established wholesale grocer was given exclusive distribution in each district, and an advertising program was directed at the housewife through her local newspapers.

When the Syracuse distributor was interviewed a year later, in September, 1935, he reported that 100 retail installations had been made in the territory and that 100 were still in operation, of which 70 were original and 30 replacements. Retailers reported sales constantly increasing and customers repeating consistently.

One retail fresh-fruit and vegetable concern reported gross sales amounting to $5,000.00 per year and was well satisfied. He stated that 25 percent of his customers were repeating consistently. He reported good sales of strawberries, red raspberries, peas, broccoli, and spinach. Fish sales were fair and meat sales small, but afforded him an easily handled meat and fish department.

The retailer's holding cabinet was a self-contained, mechanically refrigerated, white enameled storage (not display) case of 500-pounds capacity, which could be purchased for $290.00 or rented for $10.00 per month. A smaller case rented for $7.50 per month, and either case could be purchased on the rental plan. Colored lithographs were used instead of the direct display through glass windows as in the old, expensive cases. These lithographs were well done and reported as more effective in making sales than the display of the products themselves.

In Rochester, N. Y., the distributor stated that sales divided about 50 percent to the home and 50 percent to the institutional trade. The distributors' and retailers' reports agreed with the Syracuse reports as to satisfactory sales.

In Boston a leading independent retail grocer reported three years' experience with frozen products, with satisfactory results. The first year's gross sales amounted to $20,000.00; the second, $10,000.00; and the third, $12,000.00. He had his own fresh-meat and vegetable departments.

In New York City one of the leading retail grocers has handled frozen products for a number of years, and reported general satisfaction. He also handles fresh vegetables, but not fresh meats.

In all the cities visited, distributors reported frozen-food sales to the institutional trade were rapidly expanding. Hotel and restaurant operators expressed satisfaction with frozen fruits and vegetables, in some cases indicating an intention to continue to use them throughout the fresh season.

A New York wholesale produce firm which supplies the institutional trade, has been handling the frozen line in addition to its regular fresh produce for the past six years. It reported rapidly increasing sales, approximately doubling each year for the past five years, and an expectation that the 1935 sales would be between 3,000,000 and 4,000,000 pounds. A small zero holding room has been built on the delivery floor for the day-to-day deliveries. The firm is well equipped to handle this business and enthusiastic as to its future.

Only a few retail outlets were located in Philadelphia, and none in Baltimore, Washington, or Richmond. All these cities, however, reported a growing institutional trade.

A distributor in Richmond stated that he had tried to build up a retail business but had failed because of a lack of interest on the part of the housewife and the improper handling of the product in the home before it was served. He did keep a retail price-list, however, for customers who called at the warehouse for frozen products, and had steady customers of this type. His main business was distribution to the institutional trade; and he reported satisfactory and increasing sales.

A large part of institutional distribution, and practically all of the retail distribution located by the survey, was being made by one large packing and distributing company. In all cities where the intermediate-type pack of frozen fruits was available, this was being purchased to some extent by the institutional trade.

One-pound paper cups of frozen strawberries and smaller quantities of red raspberries were being distributed in Boston and, to a less extent, in New York City. Distribution was mostly through retail grocery stores whose refrigerating facilities, at best, were those of their fresh-meat departments. A few were reported as using small dry-ice storage cabinets, while others simply stacked the cups on the counter and allowed them to thaw if not promptly sold. One Boston distributor described the result as "soup," and believed this method of handling had materially reduced sales.

The present New England consumption (1935) was estimated as down to 250,000 cups per year. Declining sales were also reported in New York. All reports blamed the decline in sales on poor storage retail equipment. This opinion is borne out by the fact that the sales of 1-pound cartons of frozen strawberries and red raspberries, at higher prices, through retail stores equipped with sanitary zero-degree storage cabinets, are rapidly increasing.

ADVANTAGES OF FROZEN FOODS FOR HOME CONSUMPTION

QUALITY

Only the best products are frozen. They are rushed from the field to the packing plant and frozen before their freshness has been lost.

The Massachusetts Agricultural Experiment Station has carried on extensive research regarding frozen foods. The following is quoted from an address by Carl R. Fellers:

"Little change occurs in the chemical, enzymic, or nutritive properties as a result of freezing. The changes are largely physical. Freezing greatly reduces the number of micro-organisms present in

foods, and prevents their multiplication. Emphasis must be placed on the prompt utilization of frozen foods. Until more is known about the subject, frozen products should be consumed while still frozen or within a few hours after defrosting. More research is urgently required on the micro-biology of frozen flesh foods and vegetables.

"The ready availability of a large variety of frozen foods at all seasons will serve to give variety and balance to the human diet and should aid in decreasing nutritional deficiency diseases.

"If the juices of frozen foods are retained and eaten, there would appear to be no loss in valuable extractives . . . . Vitamins A, B, and D are uninjured by freezing. The fate of vitamin C after thawing is more uncertain, especially when stored for long periods of time . . . . Much research is needed on the effect of freezing and storage on the vitamins."

The following is quoted from *The Ice Cream Trade Journal*, August, 1933.

"Howard Supreme and Klondike varieties of fresh strawberries are excellent sources of vitamin C, only two grams daily giving good weight gains and full protection from scurvy. Preservation of strawberries by freezing, with or without sugar, had no harmful effect on the vitamin C content of the fruit. Strawberries when incorporated in ice cream showed no measurable loss of vitamin C. This is attributed to the low temperatures at which agitation, air incorporation and storage take place."

CONVENIENCE

All waste parts have been removed, the product is clean and ready for use. The cooking time for some vegetables is shortened.

COST

Comparative cost with fresh products depends on the location of the consumers and the prevailing prices of fresh products. It is probable that in any location, saving in labor, comparative quality, and the home equipment for storage must be taken into consideration; also whether the product is in season.

The elimination of waste at the source, compactness of the packages, and bulk shipments to distributing centers, serve to lower transportation charges. Mass methods of harvesting and preparation, with the possibility of some use being made of the waste parts as by-products, together with reduced spoilage in transportation and handling before reaching the consumer, should result in actual savings in comparison with fresh products.

SANITATION

Many of the old, insanitary methods of handling fresh foods are avoided. If sanitation can be assured in the packing plants, the food

kept frozen until delivered to the home, and the housewife provided with proper storage equipment or educated to cook and serve promptly, there can be no question as to the superiority of frozen foods from a sanitary standpoint. The same advantages apply in the institutional trade.

GROWTH OF INSTITUTIONAL AND HOME CONSUMPTION OF FROZEN-PACK FRUITS AND VEGETABLES

The impossibility of determining what percentage of the intermediate pack of cold-pack fruits is bought by the institutional trade and what percentage by processors, makes it impossible to estimate how much of this pack is being taken by the institutional trade.

A significant indication of the growth of institutional and home consumption is the increase in the Oregon and Washington frozen-vegetable pack:

1934	750,000 pounds
1935	7,500,000 "
1936	12,000,000 "

Also the increased green-pea pack of the leading retail and institutional packer:

1934	1,000,000 pounds
1935	3,000,000 "
1936	8,000,000 " (estimated)

The Northwest reports the following estimated frozen-vegetable pack in 1935:

Peas	3,500,000 pounds
Spinach	100,000 "
Beans—green and lima	400,000 "
Corn	1,000,000 "
Asparagus	500,000 "
Other vegetables	2,000,000 "

California is also reported as packing frozen peas, but no information was obtainable as to quantities.

One large eastern packer and distributor is reported to have packed in 1936:

Green peas	5,000,000 pounds
Lima beans	2,000,000 "
Asparagus	750,000 "

Distributed mainly to the institutional trade, a portion of this pack is reported sold to processors, presumably for soups.

No comprehensive data were obtainable on the eastern frozen-vegetable pack. One tin-container manufacturer alone reported sales in 1935 of containers for nearly 3,000,000 pounds of frozen vegetables in Maryland, New Jersey, and North Carolina. Tin- and paper-container manufacturers reported increasing sales of containers for this type of pack in the East and Midwest.

In April, 1936, *Financial World* made the following statement regarding Frosted Food Sales Corporation's (Birdseye) operations:

"Frosted Foods last year (1935) extended distribution to 70% of country's institutional trade (hotels, hospitals, restaurants, steamships, and dining cars) and stepped up its retail representation to 1,200 grocery stores, primarily in New England and New York State. Operations did better than break even last year for the first time and preparations were made to expand in New Jersey and Pennsylvania."

"Retail outlets at the close of each year:

1930	50
1931	75
1932	200
1933	400
1934	750
1935	1200
1936	1900 (estimated)"

In some cities the ice-cream retailer has shown an interest in the sale of frozen products. As their stores are equipped with small mechanically refrigerated, low-temperature, ice-cream cabinets and are usually located in residential shopping centers, it would be a logical step for them to take up the distribution of frozen food in small packages for home consumption. It would not add materially to the equipment cost and would provide a product which should have its peak sales during the low ice-cream sales months. They could carry fruits, vegetables, meats, and fish in a small space at low additional cost.

PACKING AND FREEZING FOR THE INSTITUTIONAL AND RETAIL TRADES

Any good intermediate-sized pack of frozen fruit is generally acceptable to the institutional trade. The small pack for the retail trade presents more difficulties in handling and freezing, and various methods have been adopted by processors. No investigation was made of these production operations or of the freezing of vegetables.

Western Canner and Packer describes the western methods of packing vegetables as either dry or in brine: "In the former method, each piece of vegetable (as each pea or kernel of corn) is dipped in or sprayed with water, then frozen with sufficient rapidity to form an ice glaze about it, and then filled into empty containers, after which it is ready for shipment. In the brine system, the vegetables are first put into their containers, then a brine is added, and only then does freezing occur, the pieces of vegetable being frozen in a solid block with the brine."

Hotels and restaurants interviewed reported a preference for the loose dry type as against the solid brine pack. Frozen peas, for ex-

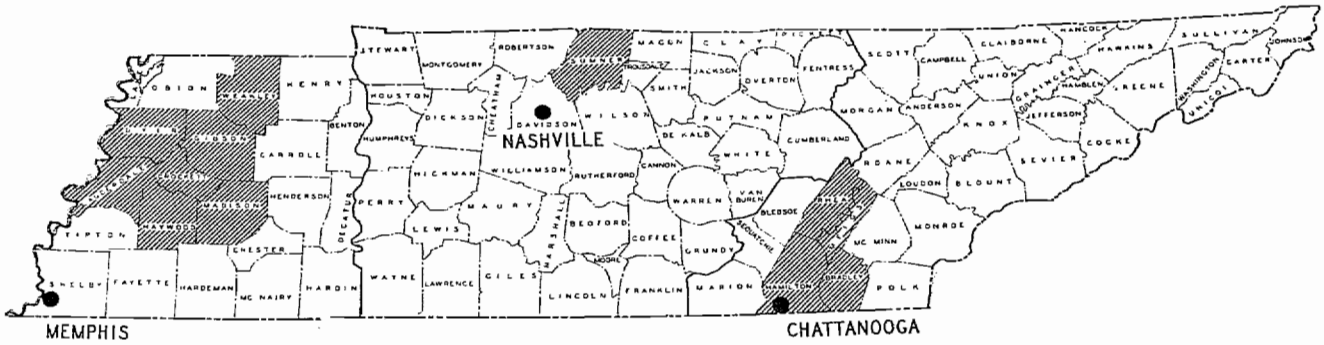

Figure 8—Location and production, in pounds, of the leading cold-pack varieties of Tennessee strawberries, based on county agent reports covering the 1935 crop.

MEMPHIS ZONE			NASHVILLE ZONE		CHATTANOOGA ZONE		
County	Klondike	Blakemore	County	Blakemore	County	Klondike	Blakemore
Weakley	1,584,000	792,000	Sumner	1,818,000	Rhea	648,000	2,628,000
Dyer	180,000	28,800			Meigs	864,000	756,000
Gibson	3,600,000	1,674,000			McMinn	219,450	10,940
Carroll	1,116,000	----------			Hamilton	166,500	291,960
Lauderdale	739,512	70,000			Bradley	----------	46,800
Crockett	1,962,000	180,000			Total	1,897,950	3,733,700
Haywood	540,000	360,000					
Madison	900,000	900,000					
Total	10,621,512	4,004,800					

ample, cook very quickly, and therefore need not be prepared ahead in quantity. The difficulty of detaching small quantities from the solid frozen block is obvious.

Not all vegetables are adaptable to freezing—notably celery and lettuce; neither do all varieties of the same vegetable freeze equally well. The same care should be exercised as to quality of raw material, variety, locality in which grown, and other considerations, as in canning.

FREEZING AND STORAGE FACILITIES IN TENNESSEE

Sharp freezer space reported now available in Tennessee is as follows: Knoxville, 22,800 cubic feet; Chattanooga, 53,700; Memphis, 230,000; and Nashville, 665,000.

It will be noted that the maximum facilities are in Nashville, and adjacent to the small strawberry-producing area in Sumner County. The only cold-packing and freezing operations reported carried on in Tennessee in the past have centered in Sumner County and Nashville.

Strawberries have been packed ready for freezing in West Tennessee, but shipped to St. Louis for freezing and holding. This important West Tennessee fruit- and vegetable-growing area has no suitable facilities for either freezing or holding.

PROCESSING SCHEDULE OF FRUITS AND VEGETABLES

Figure 9 shows the normal packing periods of various fruits and vegetables in the Northwest. This chart indicates that cold-packing operations may be started with rhubarb about May 15 and, if the plant is located in the vicinity of the producing areas, continue through the summer and fall to the close of the huckleberry season at the end of November; a total packing period of 6½ months being possible.

Comparative amounts of the various products packed indicate that operations could not be kept up to the volume packed during the strawberry season, unless other forms of processing were carried on as well as frozen-pack operations.

Figure 10 shows available information for Tennessee and indicates that packing operations may be started in April and end about October 15, a period of nearly 6 months. The development of products for packing, such as the native blueberry, would add volume for the more efficient use of packing facilities over the period.

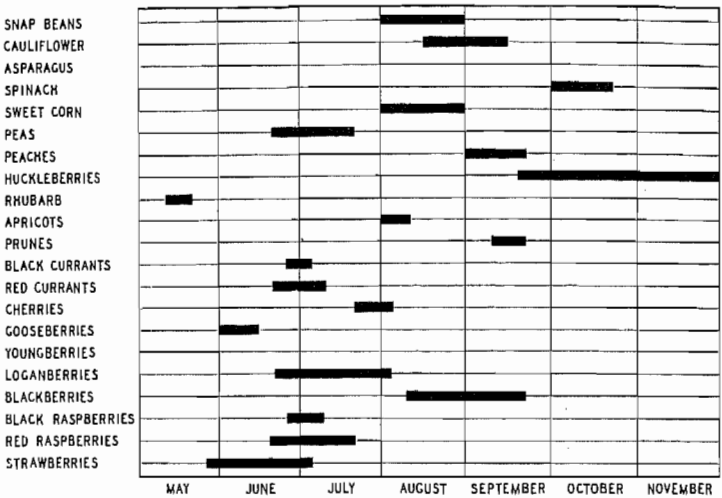

Figure 9—Normal packing periods—Pacific Northwest States.

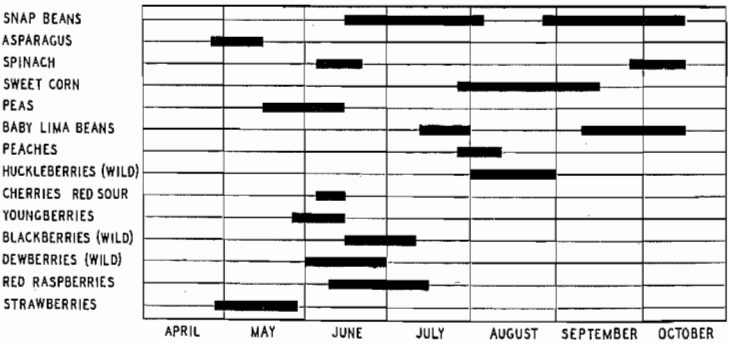

Figure 10—Normal packing periods—East Tennessee

CONCLUSIONS

Frozen-pack fruits are now firmly established, by quality, price, and convenience, as raw material for processing into other forms of food products, principally preserves, ice cream, and pies.

Preserves, which account for approximately 85 percent of the barrel-pack and 65 percent of the entire strawberry pack, are an old, established product, and there is no apparent reason for expecting any spectacular increase in their consumption. Cold-pack fruits have practically replaced canned and fresh fruits for this use.

The ice-cream industry now takes approximately 12 percent of the total barrel-pack of strawberries. Cold-pack fruits, with the exception of peaches, have very generally replaced canned and fresh fruits. Their use in ice cream might be materially increased by a campaign to change consumer tastes and increase the popularity of fresh-fruit flavors; also to extend consumer demand over the entire year. Unless the total consumption of ice cream would be increased, the ice-cream manufacturers cannot be expected to show much interest.

The preserving trade consumes so large a proportion of the barrel-pack of strawberries and other berries, that it has become a controling factor in that branch of the frozen-food industry. Other industries do not use sufficient quantities of this pack to absorb the shock of fluctuations in preserve consumption, and both packer and grower are dependent on the preserve trade, not only for volume but for price received. There seems little possibility of any radical change in the market which would alter this situation.

New packing operations intended for this market must compete with packers now established in the Northwest and East. The northwestern packer, by quality pack and salesmanship, has established the superiority of the Marshall strawberry in the minds of the trade. An analysis of variety characteristics and actual use for processing indicates that the eastern Missionary, Klondike, and Blakemore varieties are equal to the Marshall for this use, if not better. The prejudice against these varieties in some markets is apparently due to the fact that the eastern grower has considered the cold-pack market mainly as an outlet for surplus fruit and the eastern packer has not generally produced a high-class pack or practiced the most effective sales promotion and distribution of his product.

If Tennessee growers and packers will cooperate to put out a first-class pack, they should be in a good position to meet the northwestern competition, for the following reasons:

1. They have available satisfactory yields of strawberries suitable for freezing. The best cold-pack variety, the Blakemore, produces the highest yield.

2. Judging by comparison of published reports of average prices received by Tennessee growers for fresh fruit and by northwestern growers for cold-pack, the growers can afford to sell berries at a price which will permit the packer to compete with the Northwest.

3. Tennessee is nearer the markets, facilitating negotiations, as well as inspections.

4. Freight rates should be lower than from the Northwest.

5. The pack will be in the market approximately one month earlier than the Northwest pack, giving the preservers more time to make up fresh preserves for their holiday trade.

6. Federal-State Inspection Service is available to Tennessee packers.

7. There is a real demand on the part of northeastern processors for a good-quality, dependable, nearby pack.

The pie industry is not a factor in the barrel-pack of strawberries, accounting for less than one percent of the total production. It does utilize an estimated 5,000,000 pounds of barrel- and tin-pack and crate-frozen strawberries; approximately 15,000,000 pounds of frozen red sour cherries; 5,000,000 pounds of frozen blueberries; small amounts of frozen peaches, blackberries, and red raspberries; and undetermined quantities of frozen apple slices. Not having been as thoroughly converted to the use of frozen fruits in the place of canned and fresh as are the preserve and ice-cream industries, and taking into account the relatively large amount of fruit contained in a serving of pie as compared to a serving of preserves or ice cream, the pie industry is a much better prospect for increased sales. The price of frozen fruit compared with other pie filling, and consumer tastes, will be controlling factors.

The crate-frozen strawberry pack for pies is an eastern development. Strawberries packed for the fresh market are bought in the production fields, in the city fresh markets, or wherever obtainable at low prices. Spoiled berries are necessarily frozen with good berries; the fruit is not usually prepared for use, so that sorting, capping and cleaning must be done in the bakery. The pie industry wants to eliminate this work in its plants. In fact, one of the largest pie bakers now buys his crate-frozen berries capped, sorted, and cleaned ready for use in his pies. It seems probable that this outlet for frozen fruit offers an opportunity for the development of a clean, graded, high-quality pack, possibly along the line of the "single-frozen" berry pack now being developed in the Northwest.

Tennessee blackberries and youngberries should find a place in the pie industry. The annual importation of 4,500,000 pounds of frozen blueberries for pies suggests the possibility of the selection and

improvement of local wild blueberries for this market. The blueberries developed for the fresh-fruit market are reported to lack color and flavor for pies.

The market for frozen peaches, for preserves, ice cream, and pies is unfilled because of the prevalence of discoloration due to oxidation. Peaches are Tennessee's second largest fruit crop. The development of improved methods of handling and freezing, as well as varieties less subject to oxidation, would open up this market to Tennessee growers and packers.

The institutional trade and home consumption of frozen foods present greater opportunities for both the grower and the packer, in that they involve any and all foods which lend themselves to preservation by freezing. Fruits, vegetables, fish, poultry, and meat may be frozen and distributed by the same organization.

The use of frozen foods by the institutional trade is rapidly increasing. Distribution channels, storage facilities, containers, and methods of pack to meet the requirements of this market have been satisfactorily developed, and no prospective checks on increasing sales appear likely.

Packing fruits and vegetables for retail distribution is more complex. Smaller packages of various types are used and different freezing methods are employed by the packers who specialize in this market. Retail distribution has proved unexpectedly difficult because of lack of interest of the housewife and lack of both interest and facilities for handling in the case of the retailer. These difficulties seem to have been overcome by improved methods of advertising and distribution which were being tried out in a few northern cities.

Since the expansion of the frozen-food industry must be at the expense of canned and fresh produce, the subject is of vital interest to the canners and growers of Tennessee. The general replacement of either canned or fresh foods—a wild dream of the early days of frozen-food production—is most unlikely. A recent prediction gave one-third of the market to fresh foods, one-third to canned foods, and one-third to frozen-foods—which is probably as good a guess as can be made at the present time. It is not inconceivable that an even more attractive and effective form of food preservation may replace freezing.

Whatever the final balance of the three food forms, the change will be gradual in the retail market, and it is evident that until consumer demand has been created and retailers provided with the proper storage facilities, the retail market is pioneer territory and hazardous for the small packer, unless satisfactory distribution arrangements for a definite type of pack can be made in advance.

Wider distribution in small quantities to the institutional and retail trades lessens the probability of a situation comparable to the

domination of the preservers in the barrel-pack market. The broader market for various kinds of fruits and vegetables offers the packer a longer processing season and the grower a more varied production, employing land, plant, equipment, and labor over a longer period.

It is therefore strongly recommended that Tennessee shall not stop with the establishment of cold-pack operations limited to packing strawberries for processors' requirements, but shall consider the packing of other fruits and vegetables for the institutional and retail markets.

This entails the study and possible development of varieties suitable for freezing. "Tough" varieties of strawberries for shipping are not necessary, but rather a type of product having flavor and appearance satisfactory for the home garden; also of a texture that will withstand freezing.

Tennessee differs from the Northwest in that the fresh markets are more accessible. But Tennessee growers often find themselves at a disadvantage in competition for the fresh market on account of the more favorable location or earlier seasonal production in other eastern states. For instance, Tennessee strawberries come into the market after the early production of Florida, Louisiana, and Alabama, and must compete with the second-early East-Coast States, with their shorter hauls and lower transportation costs, for the northeastern market. In the important Midwest market, Tennessee must compete with the heavy Arkansas production. The logical solution of this problem seems to be an allocation of her strawberry production between a well-organized, permanent frozen-pack business and a quality rather than a quantity appeal to the fresh markets.

Whether processing should be done by growers' cooperative groups or by business interests has no bearing from the commercial standpoint, so long as the operators possess the technical and business experience and ability necessary for economic and efficient operation and successful distribution. Whether growing and processing are performed by the same or independent interests, they should show efficient operation and independent profits.

While the growing and processing of food are two distinct functions, requiring dissimilar operations, equipment, engineering, and sales services, the growers' and packers' interests are identical in that the processed product must compete with other similar products in the market.

The grower should be prepared to supply products of a quality and at a price that will enable the packer to compete with other packers in the market. He should recognize his obligation to provide the packer with a continuous supply of products, so far as weather and other uncontrollable factors will permit, so that the packer can

meet his distribution commitments. In other words, he should not expect to sell the packer his surplus when the fresh market is oversupplied and prices are low, and ignore him the next year, when fresh prices are high. When growers do not recognize this obligation the only recourse for the packer is to operate his own farms to assure a back log of supply to maintain his investment, trade name, and distribution system.

The packer, in turn, has an obligation to the grower to maintain efficiency of operation and the production of a high grade, uniform product, and to keep pace with the market and see that the demand for the product is maintained at prices which will mean a profit to the grower.

The formation of a strong trade association similar to the Northwest Fruit Barrelers Association, in Tennessee and, if possible, including other Southern and Eastern states where cold-packing is done, should be given serious consideration. Such a group working with and backed up by local growers' associations, could assist in the proper allocation of crops to the fresh market and to processing, assuring a continuous and reliable supply; also in establishing standardization of packs; uniformity of sales policies; selection of distribution outlets; a group use of trade names and labels; proper direction of publicity and advertising; and the collection of information pertaining to the location of markets, volume of consumption, and probable trends.

The importance of maintaining high standards of quality and distribution methods in the frozen-food industry cannot be overemphasized. The industry's sole reason for existence is to serve the consumer with a better and more satisfactory product than is now being obtained in the fresh market or by other processing methods. This is true whether the prospective consumers are processors, the institutional trade, or housewives. The sales slogan for frozen pack must be "Quality and Convenience."

APPENDIX

NORTHWEST FRUIT BARRELERS ASSOCIATION SPECIFICATIONS FOR PACKING COLD-PACK BERRIES

1. All containers marked or purchased as of a certain variety shall be guaranteed true to name—for example: Straight or 2 plus 1 Cuthbert raspberries or Marshall strawberries, or other varieties, shall mean 95% or over of the variety named.

2. All barrels shall be new, six-hoop, paraffine-lined, made of fir or other suitable wood.

3. All cans used for containers and storing of berries shall be enamel-lined suitable for acid fruits.

4. All packing plants shall be kept in a clean and sanitary condition, according to the State Sanitary Code. No packing in open fields, open sheds or barns, or within 100 feet of any barn, cesspool or refuse dump.

5. All berries shall be four-fifths colored, in good condition, practically free from sun or vine-dried or partially-dried, free from over-ripe or under-ripe fruit, free from visible mold and foreign substances, such as sand, dirt or trash, practically free from hulls or stems, well matured and colored for the variety and packed as soon as possible after picking, shall constitute No. 1 Cold-Pack goods. A tolerance of 5% (by weight) of in-weight of fruit for all defects shall be allowed, but no tolerance shall be allowed for moldy, wormy, mildewed or decayed fruit, and no one defect shall constitute more than one-half of the permitted tolerance.

6. The sugar used for these purposes shall be white, granulated, standard sucrose.

7. All berries must be in cold storage approximately twelve hours after packing at a temperature of not higher than fifteen degrees F. Berries to be chilled or frozen sufficiently to carry them in iced cars without danger of fermentation. All berries must have been so picked, packed, and stored as to length of time and temperature, so that no softening or fermentation might occur due to time, temperature, picking, packing or storage.

8. All barrels should be filled approximately as follows: 2 plus 1—150 lbs. sugar to 300 lbs. fruit, making a total of 450 lbs. Straight berries, 375 lbs. berries.

9. Neither ice nor water, nor sugar in solution or anything other than fruit and/or white, standard, granulated sucrose shall be added.

10. On sugared berries, sugar and berries to be weighed and not to exceed 1% variation in sugar to be allowed.

11. All Strawberries shall be washed in fresh, clean water, then properly drained before emptying into containers. All other fruits, when dirty, shall be so washed.

12. All containers must be marked, stating when and where packed.

13. The weight mark on barrels is to be the guaranteed in-weight, and the tare the guaranteed tare of containers before filling.

14. The term "field run" applies to berries that will go over a ⅝-inch mesh screen. A tolerance of 5% for berries smaller than ⅝ inch shall be allowed. Berries must be graded over a slat or hole grader. This definition shall be known as "No. 1 Cold Pack Marshall Strawberries."

15. No. 1 Marshall strawberries may be graded in three distinct sizes as field-run berry, under the term "Medium Grade Berry" applying to berries that have been graded, and all berries under ⅝ inch and over 1¼ inches in diameter eliminated. All berries over 1¼ inches should be known as "Special Large Graded Berry." Any of these sizes shall constitute No. 1 Cold-Pack Marshall Strawberries unless otherwise specifically specified in the contract.

Reference: *Western Canner and Packer* 1935 Yearbook.